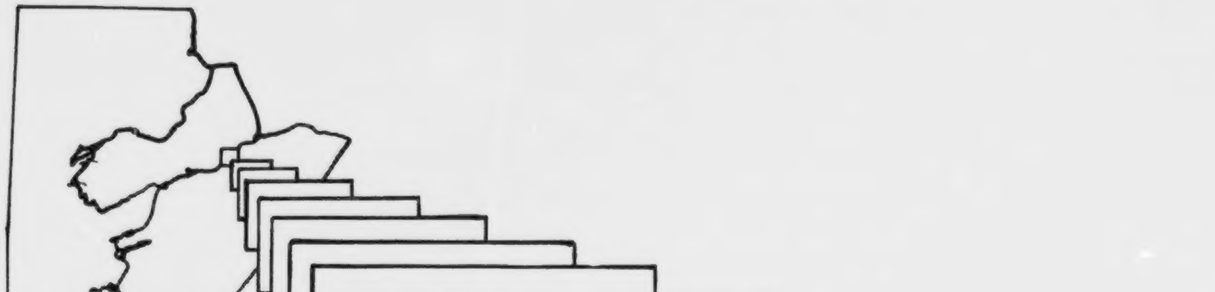
# LIMESTONE GENERATING STATION ENVIRONMENTAL IMPACT STUDY

## FINAL REPORT



manitoba hydro

February 1986

**MacLaren Plansearch Inc.**
**InterGroup Consultants Ltd**

# SUMMARY

# LIMESTONE GENERATING STATION - ENVIRONMENTAL IMPACT STUDY

# FINAL REPORT

## A. BACKGROUND AND PURPOSE

For the past nineteen months Manitoba Hydro has been conducting an Environmental Impact Study (EIS) on the Limestone hydroelectric generating station. The study has been carried out as part of the Provincial review process for such projects, and, as such, was jointly reviewed by the Manitoba Environmental Assessment Review Agency (MEARA), the Interdepartmental Planning Board (IPB), and the Provincial Land Use Committee of Cabinet (PLUC).

This study is a modified EIS. This was agreed to by the provincial agencies in light of the advanced stage of design and planning of the Limestone project, previous impact studies, the current thinking in regard to environment assessment (Beanlands and Duinker 1983), construction already carried out in the 1970s and the extent of government participation in the socio-economic aspects of the EIS. Its main orientation has been the assessment of needs and strategies for impact management rather than determination of impacts. The concept of impact management was taken to mean a range of responses to project impacts and issues, including monitoring programs, mitigation works or projects, and compensation.

The study addresses project-related biophysical and socio-economic issues occurring in the vicinity of the Limestone site, including the communities of Gillam and Bird, as well as those occurring on the Nelson River and its associated tributaries upstream and downstream of the project site. Regional issues, related primarily to northern employment and business participation in project opportunities including policies to maximize such participation and social services delivery, are being addressed through other processes by the Manitoba Energy Authority (MEA) and relevant social services departments. Also, regional liaison activities related to the project are being conducted by a Northern MLA's Committee, specially formed by the Manitoba Government for this purpose.

The EIS has been conducted in four phases in accordance with a study plan approved by IPB/MEARA and PLUC. The four phases are:

**Phase 1 - Definition of Study Scope**
**Phase 2 - Determination of Impact Management Needs**
**Phase 3 - Development of Impact Management/Monitoring Strategies**
**Phase 4 - Final Report.**

Each phase has been comprised of a research activity, followed by a liaison stage to review the documentation of study findings. The liaison process has involved Manitoba Hydro's internal review committee, the interdepartmental Technical Advisory Committee (TAC) of IPB/MEARA, the elected councils of the LGD of Gillam and the Fox Lake Band, the Gillam Brook Trout Association and the Gillam Fur Council. There also has been significant technical liaison with federal government departments, whose representatives were present at TAC meetings after Phase 1.

Jointly IPB/MEARA and PLUC approved the study plan proposed in Phase 1 and the impact management and mitigation program recommended in Phase 3.

This is the final in a series of four study reports. It consolidates the main findings of the three previous "Discussion Papers" and reviews the status to the end of October 1985 of impact management programs identified and recommended in the earlier reports.

The final report represents the culmination of the Limestone EIS process. It will be forwarded by Manitoba Hydro to IPB/MEARA. To bring the study process to a conclusion, Manitoba Hydro will request approval of the following from the Government of Manitoba:

1. that the Limestone EIS final report and the EIS research and liaison process carried out since July 1984 fulfill the environmental assessment requirements of the Government of Manitoba for the Limestone project;
2. that the proposed ongoing mitigation and monitoring programs and the ongoing impact management co-ordination process presented in this summary are acceptable to the Government of Manitoba and should be implemented.

## B. PROJECT DESCRIPTION

The Limestone Generating Station will be constructed at Limestone Rapids on the Lower Nelson River about 50 km northeast of Gillam, 25 km downstream of Long Spruce Generating Station and 6 km east of Bird. Initially, Limestone will generate 1,330 MW of electricity by harnessing the hydraulic energy of the Nelson River, operating in concert with the upstream Long Spruce and Kettle Generating Stations. Following construction of the downstream Conawapa Generating Station, the output of Limestone will decrease to approximately 1,230 MW.

The Generating Station structure spanning the Nelson River will be about 1,000 metres long. A powerhouse containing 10 turbine generators and power transformers, and 30 intake gates, will flank a 7-gate spillway on the northwest side of the river. The southeast portion of the structure will consist of a 685 metre long earthen dam. Approximately 6,000 person-years of labour will be required to complete Limestone construction between 1985 and 1992. Peak construction workforce on-site is expected during the early years of construction. Limestone workers will be housed either in the construction camp or in the nearby Sundance townsite.

Under normal operating conditions, the Limestone forebay will not exceed 85.3 metres. This represents an approximate 30 metre increase over present water level at Limestone. Minimum tailrace elevations are expected at 52 metres. Forebay water levels will display an approximate weekly drawdown cycle, beginning on Monday morning with restoration of full supply level on weekends. Flooding will be contained within the Nelson River valley (and its tributaries) and will involve less than 300 hectares of land, primarily at the confluence of the Nelson with Brooks and Clements Creeks.

## C. IMPACTS, ISSUES, AND MANAGEMENT RECOMMENDATIONS

The EIS examined a wide spectrum of potential issues and impacts associated with the Limestone project. The study team assessed various issues and impacts to determine which ones merited impact management. Through consultation, exercise of professional judgment and experience, and analysis of technical information about the project, local setting, planned mitigation and enhancement measures and the experience from Long Spruce and other relevant projects, fourteen issues or impacts were identified that required management. The list of impacts and issues is relatively moderate in length and significance due to a number of mitigating factors, including the following:

1. In many cases appropriate impact management measures have already been implemented or are planned by Manitoba Hydro, the Manitoba government and other groups to deal with potential problems, e.g., the inclusion of environmentally sensitive site procedures and mitigation measures in the specifications for project contracts, operation of a self-contained construction camp for single status workers and a temporary construction community for workers wanting to establish homes.

2. Gillam has previous experience with similar projects, i.e., Kettle, Long Spruce, making it better able to handle anticipated impacts.

3. The area flooded by the project is relatively small, i.e., less than 300 hectares (740 acres), minimizing the potential for adverse biophysical impacts and impact management needs from this source.

In this study, impact management is understood to include mitigation, monitoring or compensation. Studies such as the recommended monitoring programs may be required to generate information:

- to evaluate the magnitude of an impact, and or
- to determine mitigation options.

As such, monitoring is a very important component in, and in some cases a prerequisite to, a comprehensive program of impact management responses.

The following summarizes the anticipated project issues or effects, and the recommended responses:

__Environmental__

1. **Biophysical Monitoring** - concern about timely execution of a comprehensive biophysical monitoring program, to determine extent of environmental impacts and effectiveness of environmental mitigation measures

- Comprehensive monitoring was recommended in Discussion Paper No.3, to be carried out principally by Department of Natural Resources, focusing on fish (especially brook trout) population and habitat characteristics upstream and downstream of the dam, aerial surveys of furbearer and ungulate habitats and ungulate animal counts, location and assessment of sturgeon spawning areas, etc. Monitoring is recommended to occur over a ten-year period, three of which would likely be post-construction. Such long term surveillance will assist estimation of project effects, effectiveness of implemented mitigation measures, enhancement opportunities, the need for non-monetary compensation, etc.

- In response, and mindful of important pre-impoundment time constraints, Manitoba Hydro and the study team met with Provincial, Federal and local interests to build consensus on required monitoring, likely timing, logistical considerations and funding. Manitoba Hydro has committed to funding monitoring and mitigation costs, and provided initial project funding which ensured program initiation in June of 1985.

- on-site environmental inspection by Manitoba Hydro should be initiated to assist in the recommended environmental education of workers, to anticipate and prevent environmental accidents, to reduce the environmental impact of construction actions, etc.

2. **Brook Trout** - reductions in local populations of anadromous (sea-run) and freshwater brook trout, especially the former, a highly prized game fish and a provincial "heritage" species

- in response, Manitoba Hydro and DNR should undertake tributary enhancement (where monitoring results indicate such action is feasible)

- enforcement of various pertinent protective measures should be increased, including licencing, quotas, control of illegal fishing by increased patrols, establishment of a new fisheries-oriented senior Natural Resources Officer (NRO) on-site, establishment of spawning sanctuaries, seasonal or annual closures in various tributaries as monitoring results dictate, constriction of access by removal of construction-related access (e.g., stream crossings) after power plant operations begin, etc.

- there should be increased emphasis on environmental education of townspeople, camp residents, other workers, etc., especially non-local Treaty Indians, viz. present scarcity and vulnerability of resources to increased pressure

- impacts on the Limestone River, the most important brook trout production river in the lower Nelson system, should be mitigated by maintaining minimum water levels at the mouth of the river during spawning migration periods, planning Stage 1a cofferdam construction activities to minimize impact on seasonal spawning, by evaluation of protective rock groins at the confluence with the Nelson River, etc.

- where appropriate, stocking of depleted borrow pits, blocked headwater habitats (upstream of permanent beaver dams), etc., should be considered with species endorsed by provincial and federal scientists

- longer term monitoring results from fish habitat and population studies should be evaluated to identify the future potential utility of fish transport around the dam by means of any feasible option (e.g., "trap and truck")

3. **Furbearers and Ungulates** - added hunting and trapping pressure on furbearers and moose

- in response, enforcement of existing protective measures should be increased (e.g., using new NRO), and new measures should be implemented, e.g., establishment of 300 metre road border, "no-hunting, no trapping" refuges, improvement of trapper training, better environmental education of townspeople and workers (viz. vulnerability of scarce resources to increased pressure), initiation of headwater habitat enhancement (where possible), consideration of the need for compensation for loss or impairment of livelihood where required, etc.

4. **Sturgeon** - reduction of sturgeon populations, an historically plentiful but currently rare and potentially endangered species

- in response, critical minimum in-stream flow requirements should be determined for spawning periods, angling and commercial catch seasons should be closed completely for one minimum reproductive cycle (twenty years), habitat enhancement in spawning areas should be considered where possible, as indicated by monitoring results, etc.

5. **Heritage Resources** - disturbance of archaeological and historic sites

- in response, a phased mitigative field program should be undertaken in the summer of 1985, salvaging resources threatened by initial construction activities (i.e., borrow pit development) and priorizing further recommended salvage work, if required, for areas unlikely to be modified for several years (e.g., forebay rim)

6. **Aggregate Exploitation** - disruption of waterbodies, especiallly Moondance Creek and associated biological resources by accessing and use of borrow pits for aggregate in construction

- in response, a borrow pit development plan should be developed, especially to minimize public access to important spawning grounds on the Limestone River

- if waste rock is to be disposed of in the Nelson River, it should be placed to avoid impacts on migratory brook trout homing towards the Limestone River at night during the spawning season

7. **Shoreline Erosion** - erosion along banks of the Nelson River in the Limestone forebay, and associated water quality changes

- in response, forebay margins should be evaluated for slumping potential; where localized, clearing policies should be developed to facilitate maintenance of bank stability

## Socio-Economic

1. **Speculative In-migration** - effects of an influx of transient job-seekers to the study area

- in response, if a substantial number of speculative in-migrants appear, mass media advertising should be undertaken to discourage other transients from coming to the study area

- workshops of relevant local agencies should be held to develop contingency plans to cope with speculative in-migration

- rules for acceptable uses of the wayside park near Gillam should be established and "no squatting" regulations should be enforced

2. **Community Awareness** - need for appropriate information about Limestone project in the study area

- in response, newsletters and an open house program should be undertaken to keep study area residents informed about the project

3. **Worker Interaction** - disruption of local communities, especially nearby Bird, due to visits by project workers; tensions between native and non-native project workers; conflict between local and non-local Treaty Indians viz. exercise of Treaty resource harvesting rights

- in response, a community orientation workshop should be held in Bird about the Limestone project
- a worker orientation program, in particular, a basic orientation booklet, should be undertaken to inform workers of sensitive environmental and socio-economic issues
- the supervisory orientation program should include environmental and socio-economic considerations
- Fox Lake Band should consider a resolution to control visitors to Bird
- non-native construction workers should be informed about special lay-off provisions, particularly those considering bringing trailers to the study area

4. **Socio-Economic Monitoring** - execution of meaningful socio-economic monitoring is needed to measure changes in key variables and identify unanticipated problems

- a monitoring network, using "front line" government services, should be established in response to keep track of speculative in-migration and worker interaction problems
- an annual household survey of Gillam, Bird and Sundance should be conducted

5. **Local Employment and Business Opportunities** - concern that study area residents will get maximum opportunity to participate in project job and business opportunities

- accordingly, new jobs related to resource management and monitoring should go to qualified local residents wherever possible

- attention should be given to the initiatives by the Fox Lake Band to pursue Limestone business opportunities

6. **Business Competition** - concern about possible increased competition for Gillam businesses from Sundance businesses and transient sales people

- in response, the Gillam business community should be consulted about plans for Sundance business and Limestone business opportunities

7. **Traffic** - increased traffic, noise and dust near Bird community if Bird VII borrow pit is used

- in response, the use of Bird I borrow site should be considered by the general civil contractor instead of Bird VII

The study plan was modified after dissemination of Discussion Paper #3 to facilitate dialogue between Manitoba Hydro and other agencies regarding delivery of recommended monitoring or mitigation programs during the 1985 field season, prior to completion of the EIS. In conjunction with Phase III of the EIS, a program for implementing most of the recommended impact management programs was launched by Manitoba Hydro and relevant agencies. This program focused on what should and could be done in the summer field season of 1985, before Limestone construction resumed or progressed very far, and amounts to a commitment by Manitoba Hydro of almost $300,000. An outline of the recommended program for 1985 and 1986 is presented in Table S-1 along with an indication of the parties that have undertaken or are recommended to implement each program. Substantial progress has been made to October 1985 in regard to the recommended impact management programs:

- TAC has given an early indication of its willingness to fulfill the longer term impact management co-ordination role, and discussions continue with Canada regarding federal participation throughout the duration of the project

- DNR will shortly implement the recommended NRO position. Other recommended brook trout protection measures (e.g., establishment of spawning sanctuaries, seasonal closures) are under DNR consideration

## SUMMARY TABLE S-1

## RECOMMENDED MONITORING AND MITIGATION PROGRAMS
## JUNE 1985 to MARCH 1987

| Program | Implementation Responsibility* |
|---|---|
| **FISHERIES** | |
| Long Spruce forebay population | DNR |
| Long Spruce turbine mortality | DNR |
| Lower Nelson tributary habitats | Hydro/DNR |
| Lower Nelson tributary populations | DNR/Hydro |
| Lower Nelson sturgeon populations | DNR |
| **WILDLIFE** | |
| Habitat and populations | DNR |
| Natural Resources Officer | DNR |
| **ARCHAEOLOGY** | HRB |
| **GEOMORPHOLOGY** | Hydro/Mines Branch |
| **ENVIRONMENTAL INSPECTION** | Hydro |
| **SPECULATIVE IN-MIGRATION** | LGD, MEA, PPB |
| **WORKER INTERACTION** | |
| Community Orientation (Bird) | FLB/Hydro |
| Worker Orientation | Hydro |
| **COMMUNITY AWARENESS** | Hydro |
| **HOUSEHOLD SURVEY** | Hydro/MPB(advisors) |
| **EMPLOYMENT OF LOCAL RESIDENTS FOR MITIGATION/MONITORING** | Implementing Agencies |

* DNR = Provincial Department of Natural Resources
HRB = Provincial Historic Resources Branch
LGD = Local Government District of Gillam
MEA = Manitoba Energy Authority
FLB = Fox Lake Band
MPB = Provincial Municipal Planning Branch
PPB = Provincial Planning Branch

- Manitoba Hydro and DNR will co-operate in the design and delivery of pertinent environmental information in a worker orientation booklet to be produced by the spring of 1986
- Manitoba Hydro is currently finalizing delivery of the recommended Environmental Inspection function with DNR and the TAC
- regarding concerns for brook trout migrating up the Limestone River at low tailrace elevations, in October 1985, Manitoba Hydro has completed an initial river bottom topography survey at the Limestone River mouth, confirming a rock sill at about the 52.0 metre elevation; in 1986, studies will begin on practical mitigation measures
- DNR has completed initial studies, funded by Manitoba Hydro, seeking evidence of sturgeon colonization of the Long Spruce forebay; the absence of sturgeon confirms the concern expressed in Discussion Paper #3; studies on appropriate mitigation will resume in the summer of 1986
- Manitoba Hydro initiated the recommended historic resources mitigative field program in advance of General Civil Contractor's 1985 fall construction activities. No significant resource materials were found in areas targeted for immediate development. A program for 1986 has been designed.
- with the co-operation of DNR, the General Civil Contractor is developing the recommended borrow pit development plan. Pertinent work permits carry caveats from Fisheries Branch designed to preclude or reduce environmental damage
- the first of a series of meetings to develop local contingency plans in response to an influx of transient job-seekers was held in Gillam on August 15, 1985
- the LGD of Gillam has established rules for the use of wayside parks
- relevant agencies have been informed of their "no squatting" enforcement responsibilities
- Manitoba Hydro has begun a public information program in response to recommendations, and held the first of two "open houses" in Gillam on June 20, 1985. The first of several newsletters was sent out at the end of May 1985
- Fox Lake Band is examining a band council resolution to restrict worker visits to Bird
- initial discussions have occurred with the Fox Lake Band about the community orientation meeting

- Manitoba Hydro plans to develop the recommended worker orientation brochure by the spring of 1986
- Manitoba Hydro is conducting the recommended annual household survey of Gillam, Bird and Sundance; results will be completed in early 1986
- Manitoba Hydro has undertaken various initiatives to address the business interest of the Fox Lake Band
- the General Civil Contractor did not select the Bird VII aggregate site near Bird.

## D. ONGOING IMPACT MANAGEMENT CO-ORDINATION

The EIS is a first step in a recommended long term government-co-ordinated impact management process. To ensure this, structures or processes must be established that will ensure the continuation of appropriate short-term programs after the EIS is completed and development of appropriate longer term programs, including post-impoundment, operations-phase activities. The following structures exist, or are being developed or evaluated for this purpose:

1. The existing Provincial TAC technical review procedure should co-ordinate monitoring (and other impact mitigation) programs, and act as the forum for review of monitoring and mitigation program results; TAC has indicated its willingness to fulfill this role.
2. In addition, formation of a federal-provincial Limestone Environmental Impact Liaison Committee has been endorsed provincially and proposed to Canada for consideration, to be comprised of the province's EIS Technical Advisory Committee and the existing Federal Working Group on Limestone, whose representatives have also been attending provincial TAC meetings after Phase 1 of the EIS review process. This committee would have a scope similar to the Limestone EIS and would periodically review the status of impact management and monitoring programs proposed in the EIS. As well, it would address any emerging impact management issues that merit attention. This committee will present its views and recommendations to IPB.

3. Both the TAC and the Federal-Provincial EIS Liaison Committee would operate for the duration of Limestone construction and conceivably into the operations phase. It is anticipated that the Liaison Committee would meet at least twice a year during construction.

4. It is important to have involvement of local groups in the ongoing consultation and co-ordination process. To achieve this, TAC should organize periodic meetings with elected councils and other relevant groups in the local area; the chairman of TAC should maintain regular contact with the Administrator of the LGD of Gillam and Chief of the Fox Lake Band to discuss Limestone-related issues.

# Preface

# PREFACE

The Limestone Environmental Impact Study (EIS) has been produced by a joint venture of MacLaren Plansearch Inc. and InterGroup Consultants Ltd. (MacLaren/InterGroup) of Winnipeg, under contract to Manitoba Hydro. It was conducted to fulfill the environmental assessment requirements of the Manitoba government for the Limestone project. As such, it has been done in accordance with the Manitoba government's direction and review, through an interdepartmental Limestone Technical Advisory Committee, whose meetings also were attended by federal representatives after Phase 1 of the EIS review process.

This study began in July 1984, and is scheduled for completion in January 1986. The scope of the EIS has emphasized impact management of project-related effects in the local biophysical and socio-economic environments, with recognition of the activities of the Manitoba Energy Authority (MEA) and social service agencies. These groups have dealt with broader, regional issues, related primarily to northern employment and business participation in the project and social services delivery. The EIS study process also accommodated the widely perceived need to maximize use of the limited pre-impoundment period by Manitoba Hydro, to facilitate timely pre-impoundment data gathering and execution of recommended impact management activities in the summer field season of 1985, prior to resumption of construction.

This document is the fourth and final in a sequence of reports prepared to document the process and findings of the Limestone EIS. It builds on the previous three reports of a four-phased, iterative research and consultation process that was used throughout the EIS.

It should be noted that the EIS studies (particularly the third progress report) have defined a focused program of activities to respond to impact management requirements arising from project impacts and issues. The program emphasizes the shorter term information needs to be satisfied by activities designed for the 1985 and 1986 pre-impoundment field seasons. Manitoba Hydro, in co-operation with various government agencies, has initiated a major portion of these more immediate activities. The results of these and ongoing impact management studies in the future will be reviewed by a government review process, to monitor the effectiveness of impact management programs, and to priorize longer term information requirements as the project proceeds through operation. This EIS report thus provides a background document, facilitating a longer term government program of impact management, review of results, and co-ordination of specific mitigative or monitoring efforts.

Manitoba Hydro will be forwarding copies of the final report to those groups that have participated in the study liaison process and have received copies of previous status reports associated with the study.

Manitoba Hydro would appreciate comments with respect to this report. These comments should be forwarded to:

Dr. W. L. Everett
Environmental Services Dept.
Corporate Planning Division
Manitoba Hydro
820 Taylor Avenue
Winnipeg, Manitoba
R3C 2P4

## STUDY PARTICIPANTS AND ACKNOWLEDGEMENTS

The Limestone Environmental Impact Study was conducted by the MacLaren/InterGroup joint venture, assisted by the Environmental Services Department of Manitoba Hydro. MacLaren Plansearch Inc. had principal responsibility for study direction and biophysical issues while InterGroup Consultants Ltd. had principal responsibility for local liaison and socio-economic issues.

The study team received considerable assistance from many individuals and groups throughout the study. We would like to express our appreciation to all of these individuals and groups who contributed much time and constructive effort to the formal liaison process of the EIS, and reviewed all three Discussion Papers issued during the EIS, including the following:

1. the Manitoba Hydro Internal Review Committee;
   the Limestone project staff;
   the provincial government Technical Advisory Committee;
   the elected councils of the LGD of Gillam and the Fox Lake Band;
   the Gillam Brook Trout Association and the Gillam Fur Council.
2. departmental representatives of many provincial and federal government agencies.
3. the Manitoba Energy Authority, whose representative accompanied the study team during its regular liaison trips to the Limestone study area.
4. R. Neckoway, who assisted with interviews in Gillam and Bird.
5. the Manitoba Fly Fishermen's Association, for their participation in the study.

### STUDY TEAM

The study was managed by the Environmental Services Department of Manitoba Hydro, under the direction of Dr. W. L. Everett, Ph.D. MacLaren/InterGroup professional staff directly involved in the study were:

## Project Director

| | |
|---|---|
| G. Rempel | P.Eng., M.Sc. |

## Environmental Studies

| | |
|---|---|
| M. McKernan | M.E.S., M.Sc. |
| M. Egan | P.Eng., M.Sc. |
| R. Marr | M.Sc. |
| S. Gorrie | Ph.D.(pending) |
| H. Squirk | |

## Principal Study Advisor (Environmental Studies)

| | | |
|---|---|---|
| K. Schiefer | Ph.D. | IEC Beak Consultants Ltd. |

## Socio-Economic Studies

| | |
|---|---|
| D. DePape | M.A. |
| J. Kinley | M.E.S. |
| R. Wiens | M.A. |

## TABLE OF CONTENTS

**SUMMARY**
- A. BACKGROUND i
- B. PROJECT DESCRIPTION iii
- C. IMPACTS, ISSUES, AND MANAGEMENT RECOMMENDATIONS iv
- D. ONGOING IMPACT MANAGEMENT CO-ORDINATION xii

**PREFACE** xv

**STUDY PARTICIPANTS AND ACKNOWLEDGEMENTS** xvii

**TABLE OF CONTENTS** xix

**LIST OF TABLES** xxii

**LIST OF FIGURES** xxii

Chapter

**1 INTRODUCTION AND BACKGROUND** 1
- 1.1 INTRODUCTION 1
- 1.2 STUDY OBJECTIVES 2
- 1.3 CONTEXT OF THE STUDY 2
  - 1.3.1 Advanced Status of Limestone Project 2
  - 1.3.2 Special Initiatives by Manitoba Government Regarding Limestone 3
  - 1.3.3 Prior Environmental Study 4
  - 1.3.4 Requirements of Provincial Review Process 5
- 1.4 OUTLINE OF REPORT 6

**2 STUDY SCOPE AND PROCESS** 9
- 2.1 SCOPE 9
  - 2.1.1 Study Orientation 9
  - 2.1.2 Study Area 10
  - 2.1.3 Study Issues 12
- 2.2 STUDY APPROACH 12
- 2.3 ACTIVITIES AND STUDY PROCESS HIGHLIGHTS 15

**3 PROJECT DESCRIPTION** 21
- 3.1 INTRODUCTION 21
- 3.2 LOCATION AND GENERAL SETTING 22
- 3.3 BACKGROUND 24
- 3.4 PROJECT DESIGN 26
- 3.5 LIMESTONE CONSTRUCTION 28
  - 3.5.1 Construction Activities 28
  - 3.5.2 Construction Workforce 33
  - 3.5.3 Northern Employment and Business 36
- 3.6 LIMESTONE OPERATIONS 36
  - 3.6.1 General 36
  - 3.6.2 Forebay Levels 37

3.6.3 Discharge Rates 39
3.6.4 Staff Requirements 39

**4 BIOPHYSICAL ISSUES AND IMPACT MANAGEMENT 41**
4.1 INTRODUCTION 41
4.2 ISSUES REQUIRING IMPACT MANAGEMENT - OVERVIEW OF PROCESS AND RESULTS 41
4.3 IMPLEMENTATION OF COMPREHENSIVE BIOPHYSICAL MONITORING 43
4.4 IMPACTS ON ANADROMOUS BROOK TROUT 45
4.4.1 Ecological Monitoring 48
4.4.2 Tributary Enhancement 51
4.4.3 Increased DNR Enforcement 52
4.4.4 Site Environmental Inspection 53
4.4.5 Protection of Limestone River Stocks 54
4.4.6 Environmental Education 56
4.4.7 Fish Stocking 56
4.4.8 Fish Transport 58
4.5 IMPACTS ON FURBEARERS AND UNGULATES 59
4.5.1 Monitoring 62
4.5.2 Increased DNR Enforcement 63
4.5.3 Trapper Training 63
4.5.4 Construction and Hydro Worker Education 64
4.5.5 Habitat Enhancement 64
4.5.6 Development of a Compensation Program 64
4.5.7 Management of Camp Garbage and Hazardous Materials 65
4.6 IMPACTS ON STURGEON 65
4.6.1 Monitoring 66
4.6.2 Flow Regulation 67
4.6.3 Fishing Regulation 67
4.6.4 Site Environmental Inspection 68
4.6.5 Habitat Enhancement 68
4.6.6 Education 69
4.7 IMPACTS ON HERITAGE RESOURCES 69
4.8 EFFECTS OF AGGREGATE EXPLOITATION 70
4.9 EFFECTS OF FLOODING AND EROSION 75
Footnotes 78
Citations 79

**5 SOCIO-ECONOMIC ISSUES AND IMPACT MANAGEMENT STRATEGIES 85**
5.1 SCOPE 85
5.2 ISSUES REQUIRING IMPACT MANAGEMENT - OVERVIEW OF PROCESS AND RESULTS 85
5.3 STRATEGIES FOR IMPACT MANAGEMENT - OVERVIEW OF PROCESS AND RESULTS 89
5.4 POPULATION - SPECULATIVE IN-MIGRATION 93
5.4.1 Issues and Impact Management Needs 93
5.4.2 Impact Management Strategies 96
5.5 COMMUNITY AWARENESS 102
5.5.1 Issues and Impact Management Needs 102
5.5.2 Impact Management Strategy 102

5.6 WORKER INTERACTION 103
5.6.1 Issues and Impact Management Needs 103
5.6.2 Impact Management Strategies 105
5.7 SOCIO-ECONOMIC MONITORING 110
5.7.1 Issues and Impact Management Needs 110
5.7.2 Monitoring Strategies 111
5.8 LOCAL ECONOMY - EMPLOYMENT 115
5.8.1 Issues and Impact Management Needs 115
5.8.2 Impact Management Strategies 116
5.9 LOCAL ECONOMY - BUSINESS 118
5.9.1 Issues and Impact Management Needs 118
5.9.2 Impact Management Strategies 119
5.10 TRAFFIC 121
5.10.1 Issues and Impact Management Needs 121
5.10.2 Impact Management Strategies 121
Selected References 123

**6 CO-ORDINATION OF LIMESTONE PROJECT IMPACT MANAGEMENT 125**
6.1 BACKGROUND 125
6.2 RATIONALE FOR IMPACT MANAGEMENT CO-ORDINATION 126
6.3 PROPOSED MECHANISM FOR ONGOING IMPACT MANAGEMENT 127
6.4 LOCAL INVOLVEMENT 128

Appendix

**A LIST OF CONTACTS 131**

**B ISSUES NOT EXPECTED TO REQUIRE IMPACT MANAGEMENT 139**

**C POPULATION ANALYSIS FOR GILLAM, BIRD, SUNDANCE AND THE LGD OF GILLAM 151**

**D HOUSEHOLD SURVEY - LETTER OF INTRODUCTION AND QUESTIONNAIRE 163**

## LIST OF TABLES

Page

S-1 Recommended Monitoring and Mitigation Programs June 1985 to March 1987 x

1-1 Distribution of Study/Analysis Responsibilities for Limestone Review 6

2-2 Limestone EIS - Phase 1 Overview 17
2-3 Limestone EIS - Phase 2 Overview 18
2-4 Limestone EIS - Phase 3 Overview 19
2-5 Limestone EIS - Phase 4 Overview 20

3-1 Manitoba Hydro Limestone Generating Station Facts About the Project, August 1982 27
3-2 Limestone Generating Station - Construction Schedule - 1990 In-service 31
3-4 Operations Phase Staffing Requirements 40

5-1 Socio-Economic Issues Requiring and Not Requiring Impact Management 90
5-2 Findings and Conclusions About Socio-Economic Strategies 92
5-3 Socio-Economic Impact Management Requirements in 1985 and Subsequent Years 94
5-4 Speculative In-migration - Potential Problems and Solutions . 100

---

## LIST OF FIGURES

2-1 Limestone Environmental Impact Study Area 11
2-2 Limestone EIS -- Study Process 13

3-1 Limestone Project Area 22
3-2 Immediate Vicinity of Limestone Project 25
3-3 Flooded Area Map 29
3-4 Limestone Generating Station Location of Borrow Areas 32
3-5 Limestone Generating Station - Construction Workforce 34

6-1 Co-ordination Mechanism - Limestone Impact Management 130

# Chapter 1

# CHAPTER 1

# INTRODUCTION AND BACKGROUND

## 1.1 INTRODUCTION

In the early 1960s, Manitoba Hydro identified a series of potential hydro-electric projects along the Nelson River and one of its tributaries, the Burntwood River. The overall system development proposed the construction of some 14 generating stations, the diversion of the Lower Churchill River into the Rat-Burntwood system, and regulation of Lake Winnipeg water levels. The Churchill River diversion and the Lake Winnipeg regulation project have been completed and four of the proposed hydro-electric stations have been constructed. The Limestone station, another one in the system, is proceeding to construction starting in the fall of 1985 with initial power expected in 1990.

Limestone is the third large hydro-electric generating station to be built on the Lower Nelson River in northern Manitoba. Located downstream of the existing Long Spruce generating station, it will cost approximately $2 billion to build and ultimately will have a capacity of 1,230 MW, making it the second largest electric power plant in Manitoba.

The Limestone Environmental Impact Study (EIS) is being carried out in response to the environmental assessment requirements of the Government of Manitoba for the Limestone project. The study was initiated in July 1984 and has involved technical research and ongoing discussions with potentially affected groups located in the vicinity of the project. This is the fourth and final of a series of study reports. Overall study process, findings, and the status of recommendations made in earlier reports are presented in this report.

## 1.2 STUDY OBJECTIVES

The objectives of the Limestone EIS were specified in the first report of this series and have been adhered to closely. They are as follows:

- identify the relevant environmental and socio-economic issues associated with development of the Limestone project that may require impact management, based on technical evaluation and credible external involvement
- provide credible professional assessments of the key characteristics of these impact management requirements and develop strategies and programs for dealing with them
- provide opportunity for input of information and value judgments from affected parties in the local area, resource managers, regulatory agencies and Manitoba Hydro to maximize consensus on recommended impact management programs
- provide appropriate documentation and recommendations in reports submitted to the provincial regulatory review process.

## 1.3 CONTEXT OF THE STUDY

The Limestone EIS is distinctive in its orientation and scope. It has few of the features of a conventional environmental impact statement. For this reason, before proceeding further, it is useful to review a number of noteworthy factors and features that underlie and have significantly influenced the development of this study.

### 1.3.1 Advanced Status of Limestone Project

At the time when this study began in July 1984, Limestone was at a very advanced stage of project planning with respect to site details. Commitments were made to the main project configurations and associated engineering details in the mid-1970s. Preliminary construction began in 1976. A cofferdam that will enable construction of the powerhouse was completed in late 1978. At that time, construction and further development of the project were delayed due to reduced load growth projections.

The project was revived in 1984 when a major US power sale was negotiated with Minnesota's Northern States Power. National Energy Board approval of the sale and Government of Manitoba approval of the project were obtained in early 1985. Construction recommenced in the fall of 1985 and is projected to last about seven and one-half years. First power is scheduled for November 1990, and all generating units should be on line by late 1992.

### 1.3.2 Special Initiatives by Manitoba Government Regarding Limestone

Development of the Limestone project is of special importance to the Government of Manitoba. In 1983, the Manitoba Energy Authority was mandated to secure export sales which would enable Limestone to proceed and to provide leadership in development of the project. As well, the provincial government has devoted a great deal of effort and attention to ensuring that residents of Manitoba and, in particular, northern Manitoba, benefit from employment and business opportunities from the project. In the spring of 1984, a Northern MLA's Committee and several interdepartmental committees were established to consult with northern residents about project opportunities and to develop and help implement strategies for northern employment and business participation in the project. These committees, which have been very active since their formation, received co-ordination and technical support from the Manitoba Energy Authority.

### 1.3.3 Prior Environmental Study

In the mid-1970s, Manitoba Hydro and various provincial government departments initiated preliminary studies of environmental impact. In 1976, the Manitoba Department of Mines, Resources and Environmental Management issued several reports dealing with environmental effects of hydro-electric development on the Lower Nelson.

Some of the specific matters discussed in the individual reports were as follows:

1. Fish and Wildlife Resources Impact Assessment (Didiuk 1975) identified important aspects of fish and wildlife resources in the study region which may be subject to adverse impact from hydro-electric development and associated construction activities.
2. River Geomorphology and Timber Clearing (Penner et al. 1975) examined the effects of the new reservoir on bank erosion, sediment transport, permafrost, and on the ice regime along the Nelson River.
3. Brook Trout and Hydroelectric Power Development in the Lower Nelson River, Manitoba (Doan, et al. 1975) determined the possible effect of hydroelectric power development on brook trout populations.

In addition to these studies, Manitoba Hydro funded specific studies of brook trout population in local creeks potentially affected by the Limestone development (Gaboury 1978, 1980), building upon those begun decades earlier (Doan 1948, Kooyman 1951), and also of the archaeological resources in the area (Riddle 1975).

In 1981, the Lower Nelson Overview Study was commissioned for Manitoba Hydro to determine if any environmental, socio-economic or land use constraints existed that might preclude development of five potential hydro-electric project sites on the lower Nelson River, including Limestone (Lower Nelson Overview Study Team 1981). The study found that no such constraints existed with respect to Limestone, suggesting that none of the likely environmental impacts from the project would be sufficiently significant to produce strong opposition to its development. The study also recommended that the subsequent Limestone EIS focus on particular issues arising from its findings.

### 1.3.4 Requirements of Provincial Review Process

The Interdepartmental Planning Board/Manitoba Environmental Assessment Review Agency (IPB/MEARA) review process and the Provincial Land Use Committee of Cabinet functions as the government review process for the Limestone project. This process, which addresses both environmental and socio-economic implications of a proposed development, encompasses a three-tiered review and approval procedure involving the following interdepartmental committees:

1. Technical Advisory Committee (TAC) - consists of government department officials with expertise in the areas being considered by the review; this committee is established specifically to address a particular project
2. Interdepartmental Planning Board (IPB) - a standing committee consisting of deputy ministers
3. Provincial Land Use Committee (PLUC) - a standing committee consisting of Cabinet ministers.

The Limestone Technical Advisory Committee (TAC) was established in the spring of 1984. Preliminary guidelines were developed by TAC for an environmental impact study for the project. These recognized that the Limestone project was already very advanced and that there was limited flexibility with respect to significant modification of its fundamental technical details. Consequently, the Phase 1 Study Plan recommended a modified EIS approach that focused on programs and strategies to manage and monitor potential effects of the project. The objective was to minimize anticipated adverse effects and enhance potential opportunities associated with the project. This approach was consistent with the current state of the art in environmental assessment. (Beanlands and Duinker, 1984)

The preliminary guidelines initially required coverage of environmental and socio-economic effects of the Limestone project in the immediate project area and in the rest of northern Manitoba. In the summer of 1984, the Manitoba government decided that regional aspects of the project related chiefly to northern employment, northern business participation, policies to maximize that participation, and northern consultation would be addressed by the Manitoba Energy Authority and the Northern MLA's Committee. Manitoba Hydro would be responsible for providing a Limestone EIS that dealt with all environmental effects and those socio-economic effects occurring in the immediate vicinity of the project as described in Chapter 2. This distribution of responsibilities was incorporated in the Phase I Action Plan and is summarized in Table 1-1.

**TABLE 1-1**
**DISTRIBUTION OF STUDY/ANALYSIS RESPONSIBILITIES FOR LIMESTONE REVIEW**

| Item | Responsible Group |
|---|---|
| Environmental and Local Socio-Economic | Manitoba Hydro |
| Local Liaison | Manitoba Hydro |
| Northern Benefits (including policies to maximize participation) | Manitoba Energy Authority |
| Northern Liaison (including local area) | MLA Committee |

In addition, Manitoba Hydro, independent of the EIS review process, has maintained consultations with the Northern Flood Committee.

## 1.4 OUTLINE OF REPORT

The remainder of this report consists of five chapters and three appendices:

| | |
|---|---|
| **CHAPTER 2** | **STUDY SCOPE AND PROCESS**<br>Describes the study scope, approach, activities and study process highlights |
| **CHAPTER 3** | **PROJECT DESCRIPTION**<br>Presents relevant information describing the construction and operations phases of the Limestone project and the biophysical and socio-economic characteristics of the Limestone study area |
| **CHAPTER 4** | **BIOPHYSICAL ISSUES AND IMPACT MANAGEMENT**<br>Presents biophysical issues requiring impact management, strategies for addressing these issues and the status of these strategies |
| **CHAPTER 5** | **SOCIO-ECONOMIC ISSUES AND IMPACT MANAGEMENT**<br>Presents socio-economic issues requiring impact management, strategies for addressing these issues and the status of these strategies |
| **CHAPTER 6** | **CO-ORDINATION OF LIMESTONE PROJECT IMPACT MANAGEMENT**<br>Presents the need for long term impact mitigation and monitoring, and recommends approaches to an institutional framework to co-ordinate, facilitate and review impact management and monitoring results during the course of Limestone construction |
| **APPENDIX A** | List of people in the local area, provincial and federal government agencies and Manitoba Hydro contacted during the study |
| **APPENDIX B** | Review of issues not requiring impact management and the rationale for these decisions |
| **APPENDIX C** | Technical paper on population projections for the study area; these projections are a key item in addressing a wide range of socio-economic issues |
| **APPENDIX D** | Letter of introduction and questionnaire for the Limestone household survey |

# Chapter 2

# CHAPTER 2

# STUDY SCOPE AND PROCESS

This chapter reviews the scope, approach, activities and study process highlights of the Limestone EIS.

## 2.1 SCOPE

The scope of the Limestone EIS reflects the Phase 1 Action Plan approved by the Limestone Technical Advisory Committee and the distribution of responsibilities established by the Government of Manitoba. The main features of the study's scope are as follows:

### 2.1.1 Study Orientation

The primary orientation of the study is impact management. Impact management is the process of enhancing the project's local benefits and reducing or eliminating its adverse effects. In this study, impact management was understood to include a range of responses to project impacts and issues, including monitoring, mitigation or compensation. It is accomplished through strategies and programs developed to address specific enhancement opportunities or problems created by the project. Monitoring is a major component in impact management, by providing information that is needed to:

1. help determine if or when impact management is needed, where the existence or timing of potential impacts is uncertain; and
2. evaluate the effectiveness of impact management strategies.

The study involves the following key elements related to impact management:

1. identifying issues or impacts requiring management;
2. developing strategies and programs for impact management;
3. developing an implementation framework for strategies and programs, especially those to be undertaken in 1985.

Impact analysis was used in the process of identifying and clarifying issues. However, it was taken only as far as necessary to ascertain if an issue does or does not need impact management or monitoring, and to set the basic parameters for an impact management or monitoring strategy. In general, the level of impact analysis information needed for these purposes was considerably less than is typically pursued in conventional environmental impact statements.

### 2.1.2 Study Area

The Limestone EIS focuses on project-related environmental and socio-economic issues occurring in the region of the Limestone site, including the communities of Gillam, Bird and Sundance, and on the Nelson River and its associated tributaries upstream and downstream of the project. This area is shown as the Limestone Study Area in Figure 2-1. Environmental effects occurring in zones upstream and downstream of the Study Area are also considered, where appropriate (e.g., fish migration).

Very early in the study it was determined that prevailing water regimes in the upstream zone of Figure 2-1 would not be affected by the Limestone project. The presence of the project would not change the flow regimes that had already been established by the Kettle and Long Spruce projects which were upstream of Limestone. Consequently, incremental environmental effects in this zone were not anticipated and as a result impact management would not be needed. For this reason, the upstream zone was not a major focus in the study.

## LIMESTONE ENVIRONMENTAL IMPACT STUDY AREA

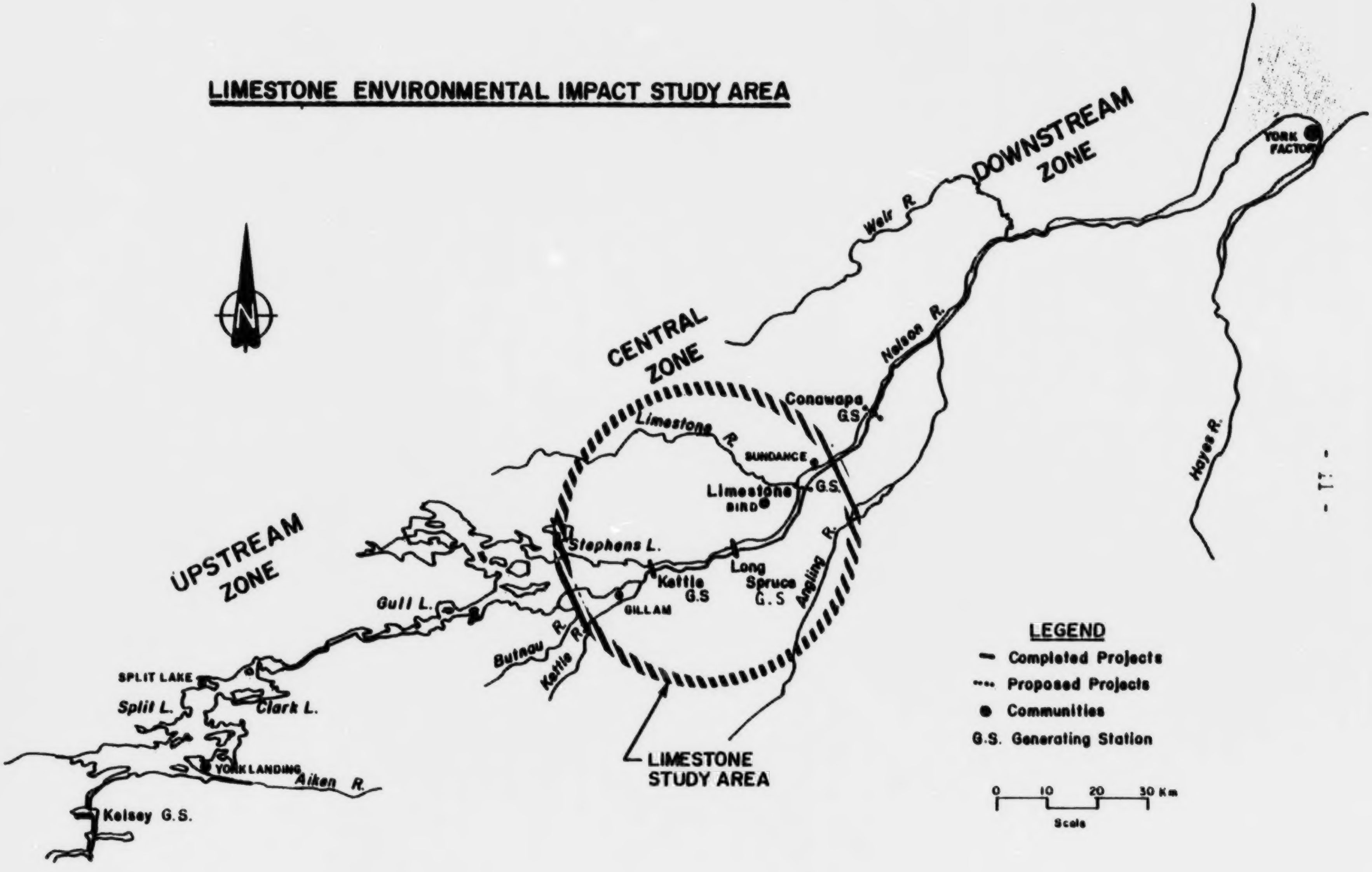


Figure. 2-1

### 2.1.3 Study Issues

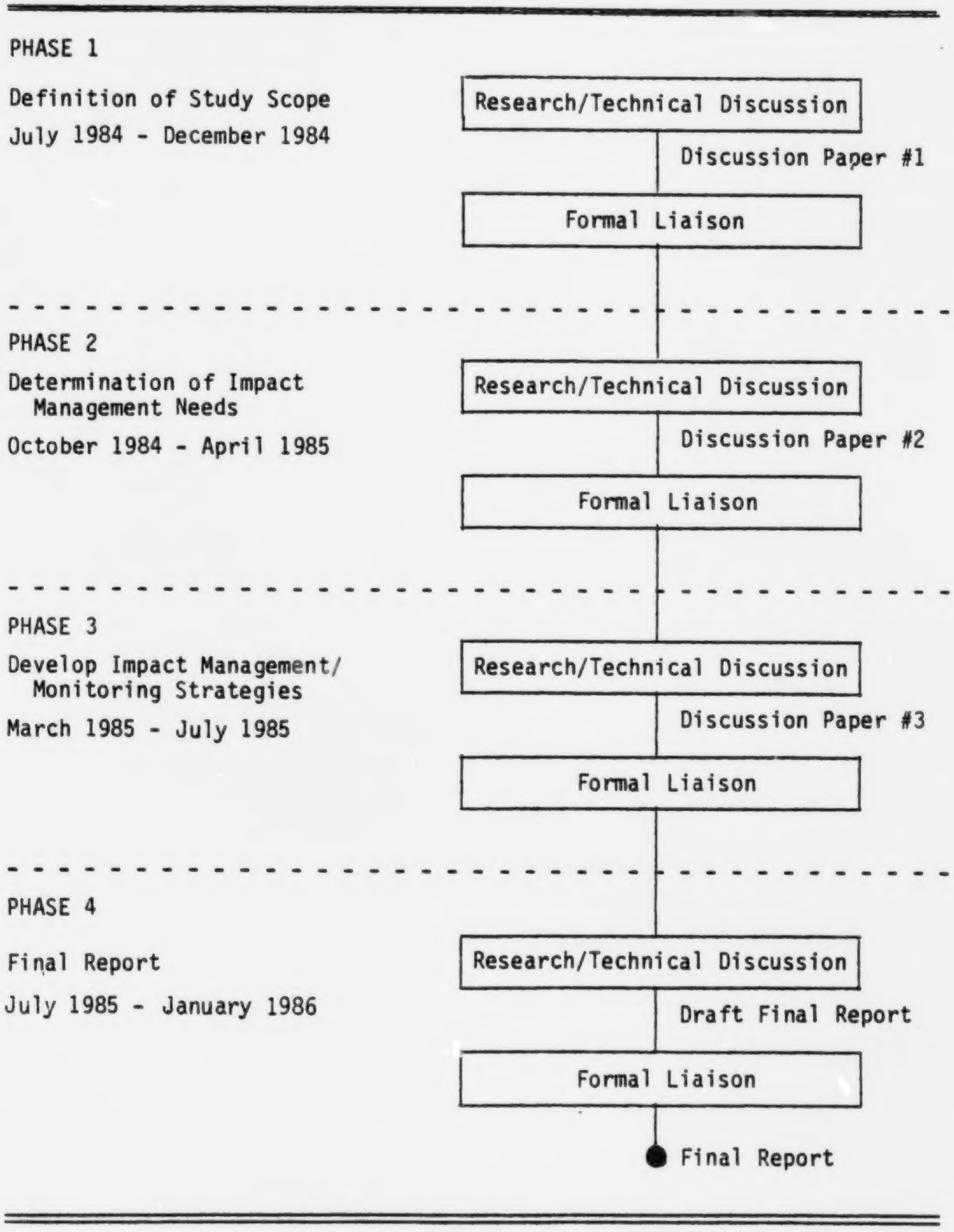
The study covers the full spectrum of project-related environmental issues occurring in the study area and all socio-economic issues affecting residents "normally" living in the study area, i.e., those people who would be living in the region regardless of the Limestone project. This includes local employment and business participation in project opportunities. Even though there is some overlap on this topic, with the northern employment and business participation work being carried out by the Manitoba Energy Authority, it is included because the needs and interests of study area residents and businesses are considerably different from those in communities that are farther away from the project. Issues regarding support services for project workers that reside in the study area during construction are not included since these do not pertain primarily to residents "normally" living in the area and they are primarily relevant to the general topic of northern and Manitoba employment in the project. These and other social service delivery issues are being addressed by the Manitoba Energy Authority in association with provincial social services agencies.

## 2.2 STUDY APPROACH

The Limestone EIS used a phased approach that emphasized progressive development and review of results and a continuing process of systematic dialogue with relevant external groups. It was organized into four phases to facilitate discussions with and reviews by these groups. The main findings and recommendations of each phase were presented in discussion papers which formed the basis for the liaison process. Each phase builds on the research and liaison review results of the preceding phases. An overview of the study process is shown in Figure 2-2.

FIGURE 2-2

LIMESTONE EIS -- STUDY PROCESS


PHASE 1
Definition of Study Scope
July 1984 - December 1984
Research/Technical Discussion
Discussion Paper #1
Formal Liaison
PHASE 2
Determination of Impact Management Needs
October 1984 - April 1985
Research/Technical Discussion
Discussion Paper #2
Formal Liaison
PHASE 3
Develop Impact Management/ Monitoring Strategies
March 1985 - July 1985
Research/Technical Discussion
Discussion Paper #3
Formal Liaison
PHASE 4
Final Report
July 1985 - January 1986
Research/Technical Discussion
Draft Final Report
Formal Liaison
Final Report

The four study phases, their timing and main features are:

- **Phase 1: Definition of Study Scope**

  (July 1984 to December 1984) scope of the EIS resolved; EIS study plan prepared and approved.

- **Phase 2: Determination of Impact Management Needs**

  (October 1984 to April 1985) issues requiring and not requiring impact management and monitoring determined; initial list of possible impact management and monitoring strategies identified.

- **Phase 3: Development of Impact Management and Monitoring Strategies**

  (March 1985 to July 1985) issues requiring impact management refined; impact management and monitoring strategies assessed and further delineated; 1985 impact management and monitoring program developed, reviewed with relevant delivery agencies.

- **Phase 4: Preparation of Final Report**

  (July 1985 to January 1986) implementation framework for the 1985 impact management and monitoring program established; final report prepared.

Each phase consisted of two components:

- **Research/Technical Discussion Component** - involved information gathering and analysis, technical discussions with relevant individuals in government or the local area, development of findings and recommendations, and preparation of documentation; culminated with completion of a discussion paper or, in the case of Phase 4, the draft final report.

- **Formal Liaison Component** - involved four sets of meetings to review and discuss the pertinent discussion paper or draft final report. Written comments also solicited as a follow-up to the meetings. Meetings held with:
  1. Manitoba Hydro internal review committee
  2. Limestone Technical Advisory Committee
  3. Local groups -- LGD of Gillam Council, Fox Lake Band Council.

As the study progressed, the newly formed Gillam Brook Trout Association and the Gillam Fur Council were included in the liaison process. Ideas and concerns arising from the formal liaison process were incorporated into the next phase's work.

## 2.3 ACTIVITIES AND STUDY PROCESS HIGHLIGHTS

The activities of the study consisted primarily of research and analysis, interviews and technical discussions, report preparation and preparing for, attending and documenting liaison meetings. Tables 2-2, 2-3, 2-4 and 2-5 at the end of this chapter provide an overview of each study phase, including a list of the main activities and some key highlights. Among the most prominent activities and study process highlights have been:

- carrying out more than forty key person interviews in Gillam, Bird and Sundance during January 1985, to obtain information about the biophysical and socio-economic environment of the Limestone Study Area, review the experience of the Long Spruce and Kettle projects and identify impact management needs and strategies

- intensive discussions with officials in the Manitoba Department of Natural Resources during Phases 2, 3 and 4 of the study, to identify and assess renewable resource concerns about the project, determine appropriate fish and wildlife impact management and monitoring strategies, and develop an implementation framework for the fish and wildlife monitoring programs to be started in 1985

- extensive analysis and refinement of strategies and programs to monitor and manage impacts on fish; this included numerous discussions with officials in the Fisheries Branch of the Department of Natural Resources and the Winnipeg regional office of the Federal Department of Fisheries and Oceans

- significant adjustments to the Phase 3 work program both to incorporate comments and concerns expressed during the Phase 2 liaison, and to facilitate dialogue with delivery agencies regarding implementation of monitoring recommended for the 1985 summer field season

- a well received and effective liaison process with a great deal of co-operation and useful input from the groups involved
- substantial agreement by the Limestone TAC and local groups with the proposed mitigation and monitoring programs presented in Discussion Paper #3; few concerns were expressed at liaison meetings or in written responses about the contents of this discussion paper. Many favourable comments were made about the discussion paper and the EIS process.

TABLE 2-2

LIMESTONE EIS - PHASE 1 OVERVIEW

| | RESEARCH/TECHNICAL DISCUSSION | FORMAL LIAISON |
|---|---|---|
| PURPOSE | -resolve scope of EIS<br>-prepare EIS study plan<br>-obtain approval of study plan | |
| MAIN PRODUCTS | -Discussion Paper #1 - Limestone EIS - Study Plan | -formal review of Discussion Paper #1 by Manitoba Hydro, the Limestone TAC and local groups |
| TIMING | -July to September 1984 | -September to December 1984 |
| MAIN ACTIVITIES OF EIS STUDY TEAM | -meetings and discussions with Manitoba government officials to resolve scope of Limestone EIS<br>-preliminary review of project description and local setting information<br>-design of EIS study plan<br>-preparation of Discussion Paper #1 | -review meetings with:<br>1) IPB/MEARA and Manitoba Energy Authority officials (Sept.4/84)<br>2) Manitoba Hydro internal review committee (Sept.25/84)<br>3) Limestone TAC (Oct.16/84)<br>4) Fox Lake Band Council, LGD of Gillam Council (Dec.11/84) |
| HIGHLIGHTS | -it was resolved that the Limestone EIS would deal with all environmental issues and those socio-economic issues occurring in the immediate region of the project<br>-MLA's Committee, Industrial Benefits Committee and Manitoba Energy Authority would deal with northern employment, northern business and northern consultation | -liaison process delayed to complete resolution of study scope and due to NEB hearings<br>-study plan was approved jointly by IPB/MEARA and PLUC |

TABLE 2-3

LIMESTONE EIS - PHASE 2 OVERVIEW

| | RESEARCH/TECHNICAL DISCUSSION | FORMAL LIAISON |
|---|---|---|
| PURPOSE | -determine issues in study area needing impact management<br>-identify potential management strategies | |
| MAIN PRODUCTS | -Discussion Paper #2 - Impact Management Needs | -formal review of Discussion Paper #2 by Manitoba Hydro, Limestone TAC and local groups |
| TIMING | -October 1984 to February 1985 | -March to April 1985 |
| MAIN ACTIVITIES OF EIS STUDY TEAM | -review of inputs from Phase 1 liaison<br>-review of available reports and other documentation<br>-discussions with Manitoba Hydro and Manitoba government officials, especially in Dept.of Natural Resources<br>-over 40 key person interviews in Gillam, Bird and Sundance<br>-newspaper file review<br>-development of relevant project description and local setting information<br>-identification and assessment of issues requiring and not requiring impact management and monitoring<br>-identification of relevant strategies to meet impact management and monitoring needs<br>-preparation of Discussion Paper #2 | -review meetings with:<br>1) Manitoba Hydro internal review committee (March 6/85)<br>2) Limestone TAC (March 20/85)<br>3) Fox Lake Band Council, LGD of Gillam Council (April 4/85)<br>4) Gillam Brook Trout Association (April 4/85)<br>5) Gillam Fur Council (April 4/85) |
| HIGHLIGHTS | -six categories of biophysical issues and seven categories of socio-economic issues were identified as requiring impact management and monitoring<br>-eighteen categories of biophysical and socio-economic issues were identified as not likely requiring impact management and monitoring | -for the first time, federal government officials attended Limestone TAC meeting<br>-extensive written comments received from provincial and federal government agencies, and from LGD of Gillam, Gillam Brook Trout Association and Gillam Fur Council<br>-comments from Phase 2 liaison have significant influence on Phase 3 discussion paper:<br>1) issue added to those needing impact management, i.e., geomorphology - flooding/erosion; and<br>2) several strategies added for consideration, e.g., band constable for Bird, local hiring for impact management/monitoring jobs, and fish stocking of borrow pits |

TABLE 2-4

LIMESTONE EIS - PHASE 3 OVERVIEW

| | RESEARCH/TECHNICAL DISCUSSION | FORMAL LIAISON |
|---|---|---|
| PURPOSE | -refine issues requiring impact management and monitoring<br>-assess and delineate impact management and monitoring strategies<br>-develop impact management program for 1985 | |
| MAIN PRODUCTS | -Discussion Paper #3 - Impact Management/Monitoring Strategies | -formal review of Discussion Paper #3 by Manitoba Hydro, Limestone TAC and local groups |
| TIMING | -March to May 1985 | -May to July 1985 |
| MAIN ACTIVITIES OF EIS STUDY TEAM | -review of inputs from Phase 2 liaison<br>-review of relevant experiences elsewhere<br>-discussions with Manitoba Hydro, federal, provincial and local government agencies, and local groups<br>-development of proposed impact management strategies<br>-development of 1985 impact management program<br>-preparation of Discussion Paper #3 | -review meetings with:<br>1) Manitoba Hydro internal review committee (May 23/85)<br>2) Limestone TAC (May 31/85)<br>3) Fox Lake Band Council, LGD of Gillam Council (June 13/85)<br>4) Gillam Brook Trout Association, Gillam Fur Council (June 13/85) |
| HIGHLIGHTS | -more than 35 impact management or monitoring strategies proposed for the life of the Limestone project with considerable emphasis on biophysical and socio-economic monitoring<br>-1985 impact management and monitoring program consists of 15 items estimated to cost approximately $300,000 | -few concerns expressed at liaison meetings or in written responses about Discussion Paper #3, many favourable comments about the discussion paper and the EIS process<br>-impact management and mitigation program recommendations approved jointly by IPB/MEARA and PLUC |

TABLE 2-5

LIMESTONE EIS - PHASE 4 OVERVIEW

| | RESEARCH/TECHNICAL DISCUSSION | FORMAL LIAISON |
|---|---|---|
| PURPOSE | -establish implementation framework for 1985 impact management program<br>-prepare final study report<br>-obtain IPB and PLUC approval of EIS | |
| MAIN PRODUCTS | -Limestone EIS Draft Final Report | -formal review of final report by Manitoba Hydro, Limestone TAC and local groups<br>-Limestone EIS Final Report |
| TIMING | -July to September 1985 | -September 1985 to January 1986 |
| MAIN ACTIVITIES OF EIS STUDY TEAM | -discussions with Manitoba Hydro, federal, provincial and local government agencies<br>-define implementation responsibilities for 1985 impact management program<br>-preparation of final study report | - review meetings with:<br>1) Manitoba Hydro internal review committee<br>2) Limestone TAC (Jan.17/86)<br>3) Fox Lake Band Council, LGD of Gillam Council (Jan.14/86)<br>4) Gillam Fur Council (Jan.14/86)<br>5) Limestone Environmental Impact Liaison Committee (Jan.17/86) |
| HIGHLIGHTS | -in response to EIS suggestion:<br>1) first Limestone newsletter sent out to all residents of Gillam, Bird and Sundance in early June 1985<br>2) Limestone open house held in Gillam (June 20/85)<br>3) initiation of mitigative archaeology field work, fisheries studies, household survey, etc.<br>-in early June 1985 PLUC decided:<br>1) Manitoba Hydro should cover costs of Limestone mitigation and monitoring programs<br>2) Limestone TAC mandated to review implementation of impact management programs<br>-Manitoba Hydro initiated discussions and actions to ensure implementation of programs | |

# Chapter 3

# CHAPTER 3

# PROJECT DESCRIPTION

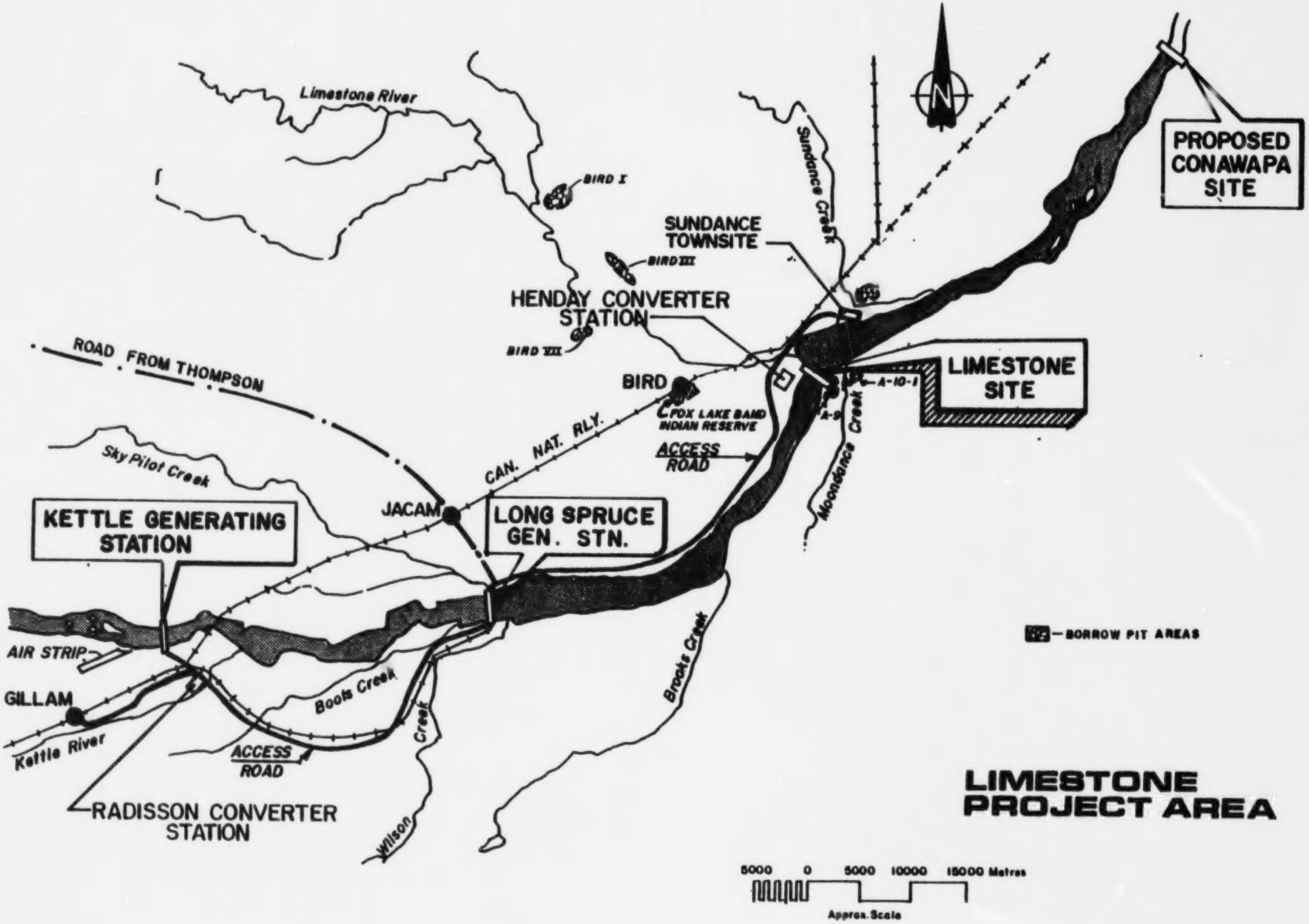
## 3.1 INTRODUCTION

This chapter defines the Limestone Project in terms of location, construction details and proposed mode of operation. An understanding of the project description information is necessary to fully comprehend the remainder of the report. Much of the information has been provided by Manitoba Hydro. Information originating from other sources is referenced.

## 3.2 LOCATION AND GENERAL SETTING

The Limestone Generating Station is under construction at Limestone Rapids on the Lower Nelson River about 50 km northeast of Gillam and 25 km downstream of the Long Spruce Generating Station (Figure 3-1). Limestone will operate in concert with the other two Lower Nelson River Generating Stations (Long Spruce and Kettle). These stations generate electricity by harnessing the hydraulic energy of the Nelson River which is a large, fast flowing river draining 1,072,000 km² from the Rocky Mountains to within 20 km of Lake Superior. In addition to its natural flows, the Lower Nelson River has been augmented by approximately 30 per cent due to the Churchill River Diversion Project (CRD). The CRD diverts a weekly average of 850 $m^3$/sec from the Churchill River, or about 75 per cent of its average dry-weather flow, into the Nelson River tributary Rat-Burntwood Rivers System. The Churchill River is a large, fast flowing river that drains 300,000 km² from northeast of Edmonton to Hudson Bay.

The Limestone project area is accessible by road, rail and air. An all-weather road has recently been completed from Thompson to Gillam, Kettle and Long Spruce. With a population of about 1,200



LIMESTONE PROJECT AREA

Figure. 3-1

people, Gillam is the principal community in the region. In recent years, Gillam's population has fluctuated based on the amount of Manitoba Hydro construction occurring nearby. During the Kettle and Long Spruce projects, the Gillam population has been twice its current level. As a result, the community's infrastructure generally possesses excess capacity; however, it is unlikely that Gillam's population will increase to the same magnitude for the Limestone Project as was experienced with the Kettle and Long Spruce projects. This is because Manitoba Hydro has established on-site facilities for the Limestone construction workers, and Sundance, a Manitoba Hydro townsite 5 km northwest of the construction site, will accommodate construction staff with families. Single workers will be housed in the construction camp adjacent to the construction site.

The only other community in the project area is the small native community of Bird (population 200± persons), located 6 km west of the construction site on the reserve lands of the Fox Lake Indian Band. This community has been growing in recent years as more band members relocate from Gillam to new housing in Bird. This relocation process should end in 1986.

In the Limestone area, the Precambrian Shield is overlain by Paleozoic dolomitic limestones and sandstones. Approximately 30 m of unconsolidated Quaternary sediments, including clayey tills, marine and lacustrine silts and clays and local deposits of glaciofluvial sands and gravels, overlie the Paleozoic rocks. The topography is flat to rolling, with the only marked relief being at the Nelson River and its tributaries. At Limestone, the Nelson River is deeply entrenched into the Quaternary sediments. The Paleozoic rocks begin outcropping on the Nelson River shoreline and within the river-bed at Limestone Rapids, and the river is deeply entrenched in these rocks further downstream.

Black spruce forest is the principal vegetation cover along the Nelson River banks. The density of forest cover decreases up-slope. The upland areas are generally poorly drained and consist of sparse black spruce forest with peat bogs, fens and scattered tamarack stands.

The climate is humid subarctic, characterized by cool short summers and long cold winters. Frost can occur during all 12 months of the year with only 13 to 70 frost-free days per annum (LWCNR, 1975b).

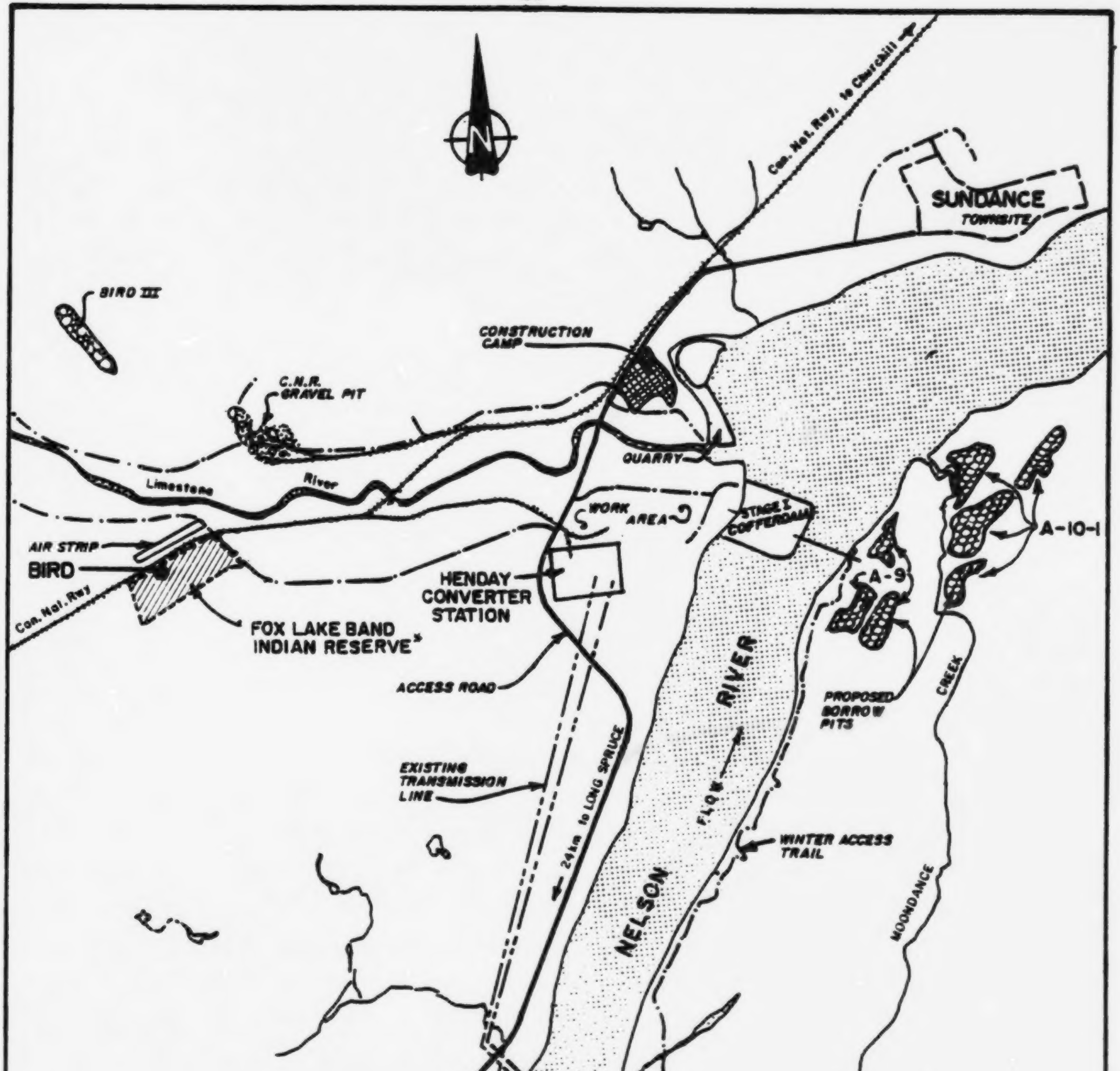
## 3.3 BACKGROUND

In 1976, upon receipt of a Provincial Interim License, work began on the Limestone project. The Interimm License, dated July 9, 1976, permits Manitoba Hydro to divert, store and use water for the development of power at the Limestone site. The license was based on having one generating unit in service by 1983 and full completion of project construction in 1985. Federal approval pursuant to the Navigable Water Protection Act was also obtained.

Construction of the Stage I cofferdam, construction camp, Sundance townsite facilities and site infrastructure (Figure 3-2) continued until 1978 when work ceased due to decreased future power demand projections. At that time, it was determined that power from Limestone would not be required until the early 1990s rather than the previously projected date of 1983. This decision precipitated the termination of construction activities and the temporary decommissioning of the camp, town and work area buildings and facilities. Prior to the shutdown, the Stage I cofferdam was completed. Further delays in the Limestone Generating Station were approved in 1979 and 1980.

In 1983, in response to proposed power exports to the United States, the Limestone project was revived with a scheduled in-service date of 1990. The proposed US export was subsequently approved by the National Energy Board following a series of public hearings in November 1984. An application to amend the Limestone Interim License was submitted in late 1982 and was approved in May 1984.

The development of the nearby Henday Converter Station has paralleled the initial activities at Limestone. A converter station converts AC power to DC power and boosts the voltage to facilitate



* FOX LAKE BAND IS TENTATIVELY CONSIDERING ANOTHER RESERVE AREA NORTH OF THE EXISTING RESERVE ALONG THE LIMESTONE RIVER; IT WILL EXCLUDE THE PRESENT AIRSTRIP

IMMEDIATE VICINITY OF LIMESTONE PROJECT

Figure 3-2

efficient power transmission to southern markets. It was planned that Henday and Limestone would use many common facilities including roads, construction camps and the Sundance townsite. In late 1974, work began on these common facilities to ensure that sufficient services were available for Henday Converter Station construction which began in 1975. Power was first transmitted from Henday in 1979 when the Long Spruce Generating Station began operations.

In 1982, some of the camp and townsite buildings and services were reactivated to accommodate staff involved in construction of an extension to the Henday Converter Station. This project is scheduled for completion in 1985. Except for transmission lines linking Limestone to Henday, no further expansion of the converter station will be required to accommodate the completion of the Limestone project. The transmission line linking Limestone to Henday is scheduled for construction one year prior to initial Limestone power production.

## 3.4 PROJECT DESIGN

The Limestone Generating Station structure spanning the Nelson River will be approximately 1,000 metres in length. A powerhouse, containing 10 turbine generators and power transformers and 30 intake gates, will flank a 7-gate spillway on the northwest side of the river. The southeast portion of the structure will consist of a 685 metre long earth dam. An additional earth dam/dyke structure, approximately 650 metres long, will be situated on the north side of the river parallel to the river-bank. In total, the structure will be over 1,700 metres long. The project is currently estimated to cost about $2 billion, making it the largest construction project ever undertaken in Manitoba. Table 3-1 is a summary fact sheet on the Limestone project.

A maximum of 1,330 MW of power will initially be generated by the Limestone Generating Station. The maximum output will decrease to 1,230 MW after the planned downstream Conawapa Generating Station has been constructed and is in operation. This decrease will be attributable to the water level rise in Limestone's tailrace (Conawapa's

## TABLE 3-1

### MANITOBA HYDRO
### LIMESTONE GENERATING STATION
### FACTS ABOUT THE PROJECT
August 1982

| | |
|---|---|
| Location | . On the Nelson R<br>. 750 km (470 mi) north of Winnipeg<br>. 260 km (160 mi) south of Churchill |
| Total Capacity | 1,330 MW (Pre-Conawapa)<br>1.230 MW (Post-Conawapa)* |
| No. of Units | 10 |
| Rated Net Head | 29.8 (Pre-Conawapa, Full Plant)<br>27.6 (Post-Conawapa, Full Plant)* |
| Construction | 1976-1978 and ____ ____ |
| First Unit In-service | - |
| Estimated Cost (Total) | - |
| Transmission | 230 kV to Henday Converter Station ±450 kV dc to Winnipeg |

**Reservoir**

| | |
|---|---|
| Normal Full Supply Level | 85.3 m |
| Live Storage | 2.8 x 107 $m^3$/m |

**Tailwater**

| | |
|---|---|
| Tailwater el | Range for Pre-Conawapa 52 - 59 m<br>Range for Post-Conawapa 56.5 - 57.5 m* |
| Tailrace Channel | |
| Length | 870 m |
| Invert el | Varies from el 45 to 49.5 m |
| Width | Varies from 265 to 520 m |

NOTE: The above facts are based on the design arrangement as existing August 1982 and with a centerline of distributor @ el 51.0 m.

**Intake Structure**

| | |
|---|---|
| Type | Integral with Powerhouse |
| El of Intake Dock | 87 m |
| El of Intake Gate Sill | 47.677 m |
| Intake Gates (Wire Rope Hoists) | 30 @ 5.5 x 14 m |

**Powerhouse**

| | |
|---|---|
| Unit Spacing | 26.5 m |
| Powerhouse Length (Incl Service Bay) | 299 m |
| Powerhouse Width | 56.5 m |
| Turbine (fixed blade propeller) | 135 MW[1],[2] (Pre-Conawapa)<br>125 MW[1] (Post-Conawapa)* |
| Runner Diameter | 7.924 m |
| Speed | 90 r/m |
| Generator (umbrella type) | 165 MVA (at 0.75 pf) |

**Spillway**

| | |
|---|---|
| Type | Ogee crest and stilling basin with baffle blocks and vertical end sill |
| Design Discharge | 9,500 $m^3$/s |
| El of Spillway Crest | 71.6 m |
| Spillway Gates | 7 @ 13 x 16 m |

[1] Output per unit with full plant running
[2] Output restricted to limit cavitation pitting

**South Earth Dam**

| | |
|---|---|
| Type | Impervious core with granular shells and rockfill toes |
| Crest Length | 685 m |
| Max Height | 40 m |

**North Earth Dam**

| | |
|---|---|
| Type | Impervious core with granular and rockfill shells |
| Crest Length | 650 m |
| Maximum Height | 40 m |

| | | |
|---|---|---|
| Total Dam & Dike Volume | 2 700 000 $m^3$ | |
| | N Dam (Incl trans) | 1 100 000 |
| | S Dam | 1 600 000 |

**Main Rockfill Cofferdams**

| | |
|---|---|
| Total Volume | |
| - Stage I | 2 549 000 $m^3$ (Incl pumphouse, and tailrace cofferdam) |
| - Stage II | 862 000 $m^3$ (Incl maintenance) |
| Average Height | 17 m |

**Excavation Quantities**

| | |
|---|---|
| Rock | 3 200 000 $m^3$ (Incl 1977-78 excavation |
| Overburden | 394 000 $m^3$ |
| Cofferdam Removal | 1 452 000 $m^3$ |

| | |
|---|---|
| Total Concrete | 600 000 $m^3$ |
| Total Reinforcing Steel | 27 000 tonnes |
| Total Cement | 132 000 tonnes |

*Based on an assumption of 56.5 HWL for Conawapa at Axis B

Source: Manitoba Hydro

forebay) and the resultant 2.2 m reduction in rated head.

Figure 3-3 is a flooded area map of the Limestone forebay. Flooding is expected to affect less than 300 hectares of the Nelson River Valley and its tributaries between Long Spruce Generating Station and Limestone, as the forebay will be almost completely confined within the existing Nelson River channel (Penner et al. 1975).

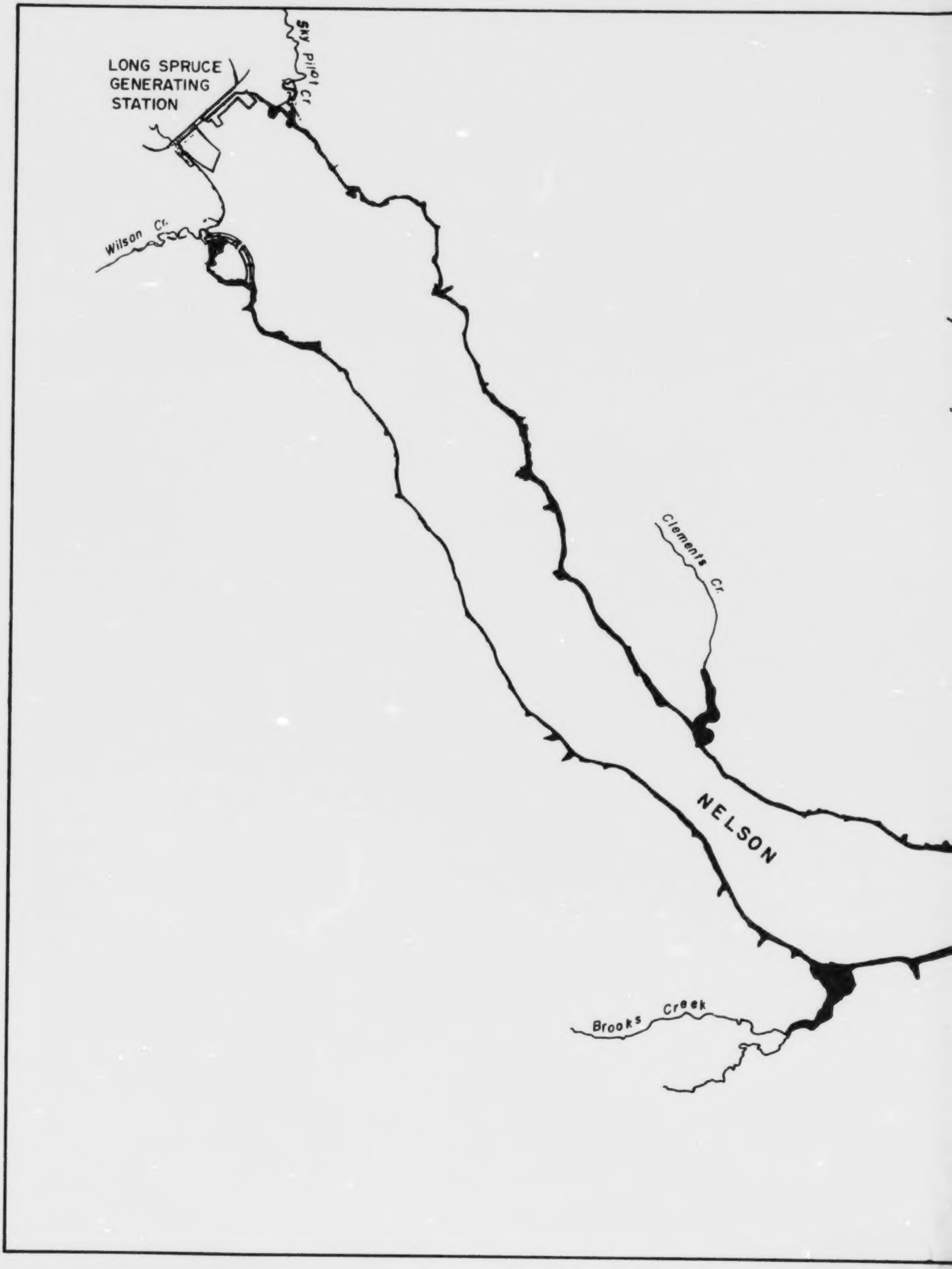
## 3.5 LIMESTONE CONSTRUCTION

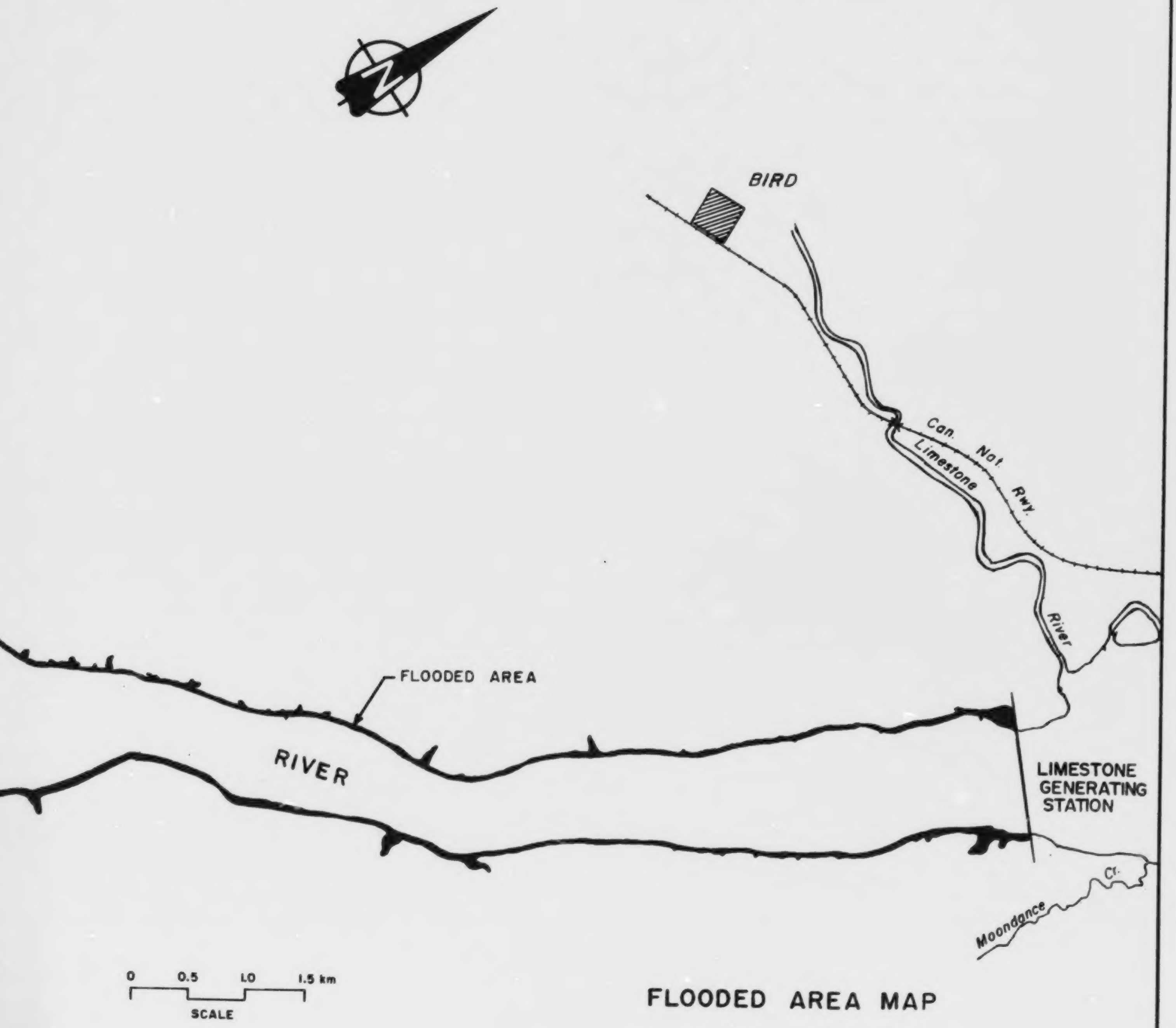
### 3.5.1 Construction Activities

Construction of the Limestone Generating Station began in 1976 and proceeded until completion of the Stage Ia cofferdam in 1978. The cofferdam is located on the north side of the river and was built to facilitate construction of the Limestone powerhouse and spillway. The cofferdam constricts the Nelson River to one-third the original width at Limestone Rapids. However, water levels behind the cofferdam are raised above natural post-diversion, post-Long Spruce levels only during ice jamming conditions. A Stage Ia cofferdam extension will be built onto the existing cofferdam to facilitate excavation of the tailrace channel. This extension to the cofferdam will restrict the Limestone River mouth to a width of less than 50 metres. Upon completion of the powerhouse, spillway and tailrace channel in the fall of 1989, the north cofferdam will be removed and construction of the south dam structure will begin.

Construction resumed in September 1985 and is scheduled to continue over an 8-year period. This second or main construction phase will involve the following activities:

1. finalization of the detailed engineering design;
2. procurement, upgrading and expansion of the construction camp, work area and Sundance townsite;
3. construction of the powerhouse, spillway, Stage Ia cofferdam, tailrace channel, service bay, intakes, Stage II cofferdam, north dam and dyke, south dam, and transmission line to Henday;


LONG SPRUCE
GENERATING
STATION
Sky Pilot Cr.
Wilson Cr.
Clements Cr.
NELSON
Brooks Creek



FLOODED AREA MAP

Figure: 3-3

4. installation of the turbines and generators.

Table 3-2 is a schedule for the various construction activities. All construction activity will be based at, and co-ordinated from, a work area for Manitoba Hydro and its contractors located on the north bank of the Nelson River adjacent to the site of the main structure.

Equipment, materials and supplies required for the project are expected to be shipped largely by rail. However, with the opening of the all-weather road into the project area, there could be significant competition for shipping contracts from truckers. Some time-sensitive supplies, may be transported by air.

Manitoba Hydro has estimated the required quantities of various construction materials needed to complete the project. Supplies of earth borrow, rock borrow and concrete aggregate have been identified, sampled and tested by Manitoba Hydro. Suitable sources for most of these construction materials have been located within 12 km of the construction sites (Figure 3-4). Several borrow pits located on and adjacent to the work area have been depleted. Much of the required material for proposed construction will be obtained from borrow pits located to the northwest near Bird, Sundance and on the south side of the Nelson River along Moondance Creek. Concrete sand will likely be supplied from pits B-7 and/or B-1 whereas coarse aggregate will be obtained from an excavation within the Stage I cofferdam. Borrow pits on the south side of the Nelson River will not be developed until 1 to 2 years prior to first power (1988-1989).

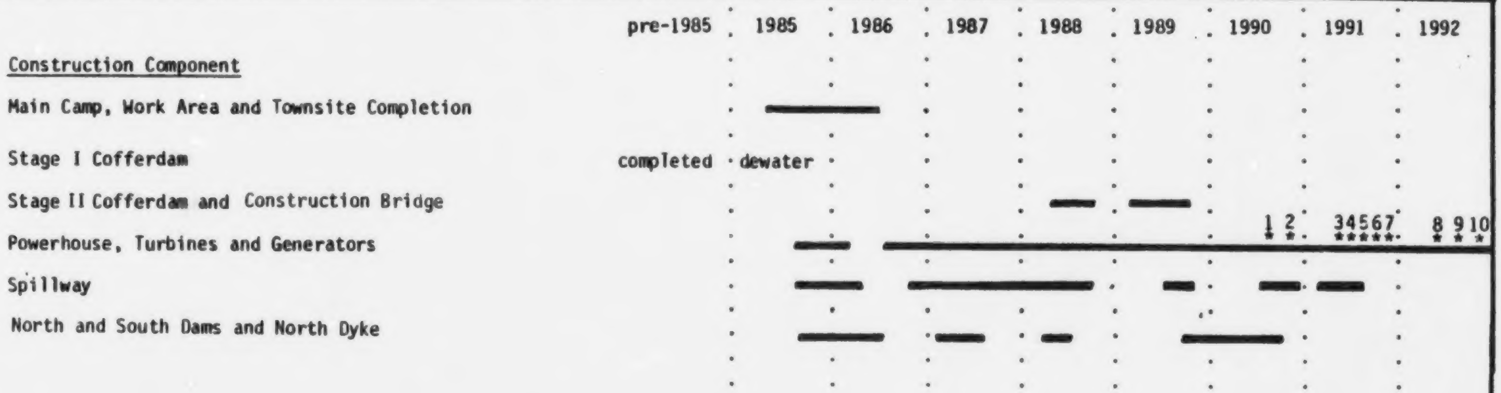
Very little clearing will be required in the forebay area prior to flooding. Most of the flooded land (<300 ha) will be confined to the Nelson River Valley and will be within the vegetation-free ice-scoured zone (Figure 3-3). Only in some tributary valleys and in close proximity to the Limestone Generating Station, will timber be flooded and require clearing. Clearing policy will be selective and will attempt to maximize shoreline stability.

TABLE 3-2

## LIMESTONE GENERATING STATION - CONSTRUCTION SCHEDULE - 1990 IN-SERVICE

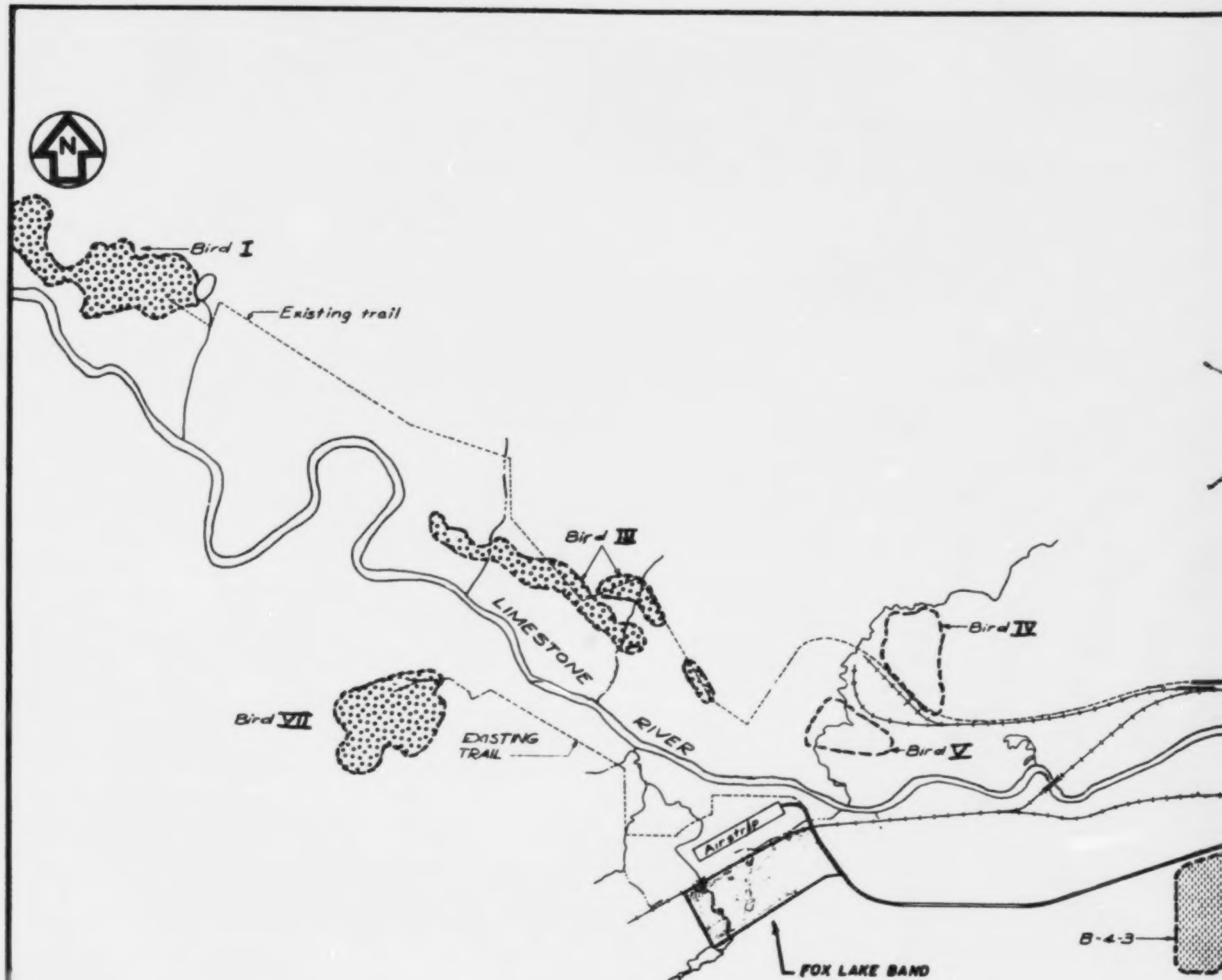
### KEY DATES

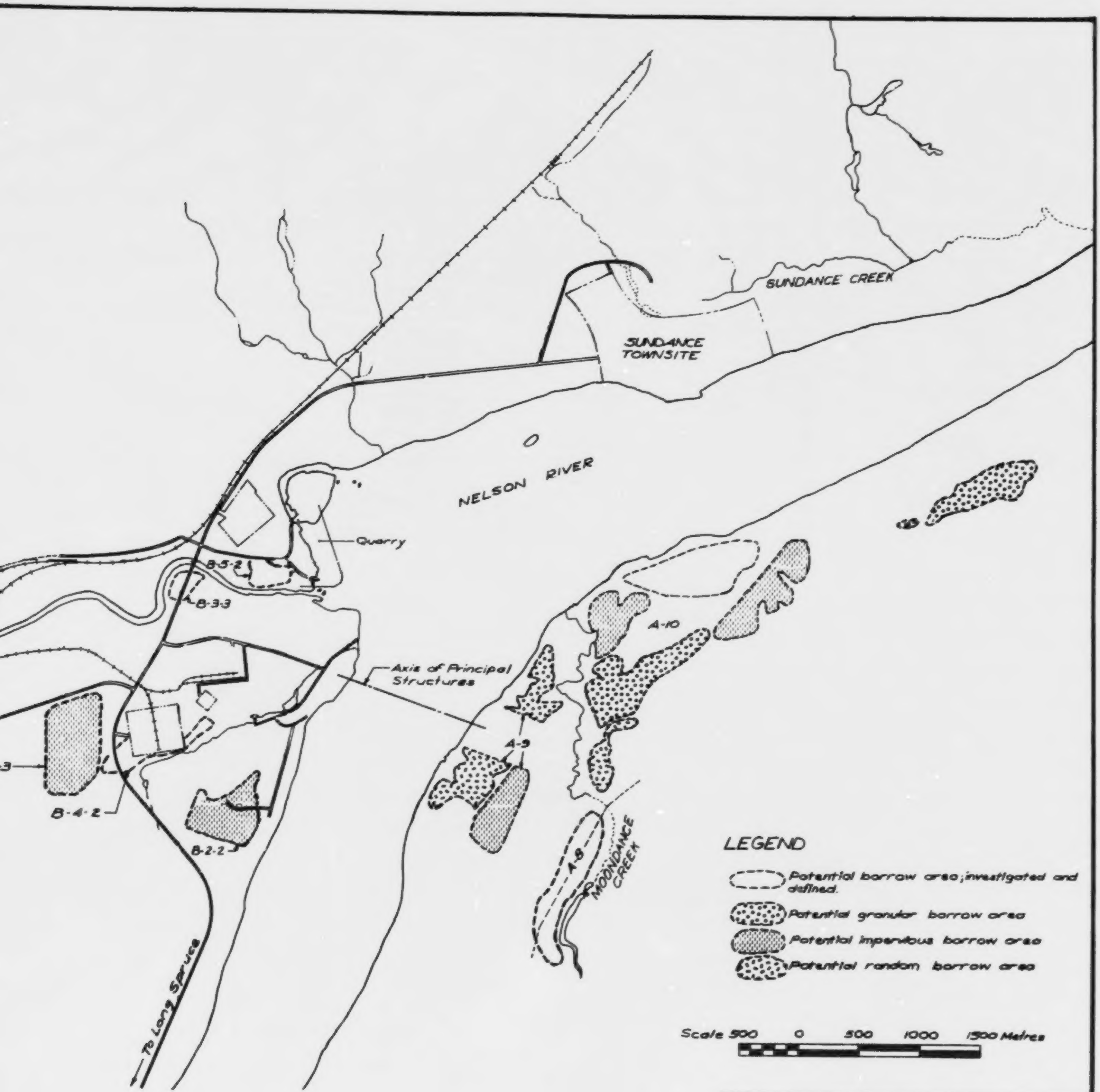
START GENERAL CIVIL CONTRACT - late summer 1985
START POURING CONCRETE - summer 1986
DIVERSION OF NELSON RIVER STAGE II - fall 1989
FIRST POWER - late 1990



*In-service date of generating units

Source: Manitoba Hydro, 1985.


N
Bird I
Existing trail
Bird III
LIMESTONE
RIVER
Bird IV
Bird V
Bird VII
EXISTING TRAIL
Airstrip
FOX LAKE BAND
INDIAN RESERVE
B-4-3


SUNDANCE CREEK
SUNDANCE TOWNSITE
NELSON RIVER
Quarry
B-5-2
B-3-3
Axis of Principal Structures
A-10
A-9
A-8
MOONDANCE CREEK
-3
B-4-2
B-2-2
To Long Spruce
LEGEND
Potential borrow area; investigated and defined.
Potential granular borrow area
Potential impervious borrow area
Potential random borrow area
Scale 500 0 500 1000 1500 Metres

**LIMESTONE GENERATING STATION**

**LOCATION OF BORROW AREAS**

Figure: 3-4

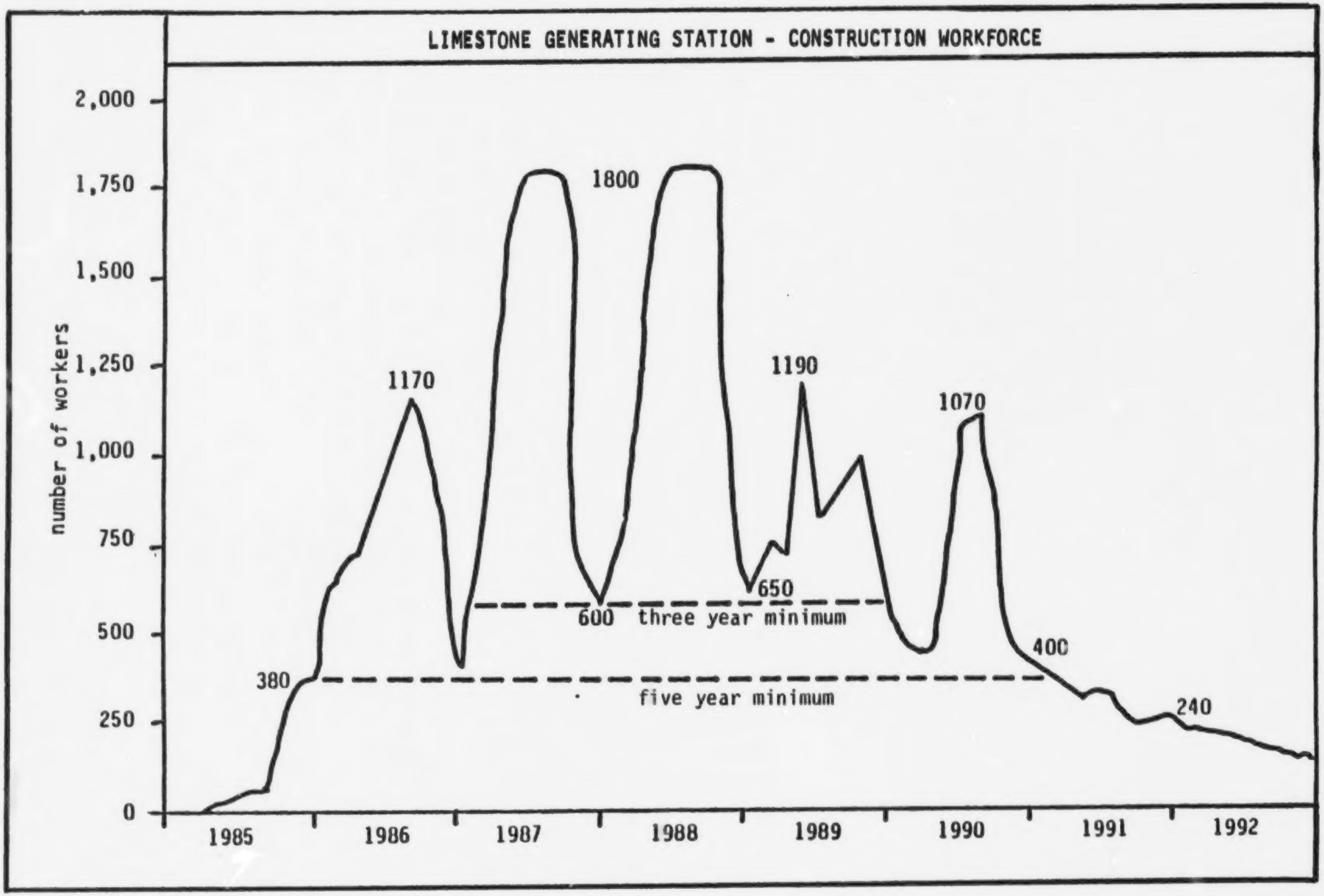
### 3.5.2 Construction Workforce

About 6,000 person-years of labour will be required to complete the main construction phase of the Limestone project. The vast majority of workers will be employed by construction contractors with the remainder being Manitoba Hydro and service-related employees. Most workers will be members of construction trades unions with labourers, operating engineers, teamsters, and carpenters being the most heavily represented skill areas. An initial estimate of monthly projected labour requirements throughout construction is shown in Figure 3-5, however there can be significant differences between projected and actual labour requirements depending on the specific circumstances encountered by the contractor at the time of construction. Experience on previous northern Hydro projects reveals that unanticipated events invariably emerge (Personal Communication, J. Callum, Manitoba Hydro). Therefore Figure 3-5 should be considered accurate to a range of ± 20 per cent. More accurate projections are currently being developed by the General Civil Contractor. Preliminary indications are that peak employment will be less than the 1,800 value shown, and may occur in 1986. Winter employment levels may be much lower than initially projected.

The construction camp at Limestone will be expanded to accommodate approximately 1,400 workers. Single occupancy accommodations will be provided except during peak periods. An additional 400 workers may reside in family accommodations within the towns of Sundance, Gillam and on the Fox Lake Band Reserve.

The construction camp is located immediately north of the construction work area. Separate facilities are provided for single men and women. Within the camp area there presently exists a small kitchen/dining complex, a beverage room, recreation buildings providing curling, commissary, gymnasium, television, etc., ambulance and fire garage. A larger kitchen/food storage building and further sleeping quarters will be added. Sewage is processed in a two-cell lagoon that discharges directly to the Nelson River. The lagoon has been approved by the Clean Environment Commission and discharges are monitored.

FIGURE 3-5



Source: Manitoba Hydro, 1984.

A solid waste landfill site managed by Manitoba Hydro and a Shell Canada Ltd. fuel storage facility are both operated according to prevailing provincial regulations and under the auspices of the appropriate licences issued by Environment Management Division. All contingency planning required by law and stipulated in various provincial regulations and guidelines is in place to be effected in the event of an environmental accident.

Access to the camp is controlled by a security force. Camp residents will be subject to strictly enforced regulations. There are no special restrictions on their movements outside of the camp area. All workers living in the construction camp will get free room and board.

The Sundance townsite will be managed by Manitoba Hydro and its use will be limited to Hydro and contractor personnel and to people providing services in the townsite. Any lots remaining after key personnel are accommodated will be made available on a first come, first served basis to workers willing to pay the rent and supply their own trailers. Unionized workers who choose to live outside the construction camp will be given a daily living allowance. All housing will be modular to enable easy movement of the housing units and future abandonment of the townsite.

Each lot will be serviced with sewer, water, telephone and electricity. A rotating biological contactor unit provides sewage treatment. The unit is equipped with a vacuum filter for dewatering sewage sludge. Effluent is discharged into the Nelson River, per Clean Environment Commission order. Water for the town and camp is supplied from the Nelson River pumphouse located on the Stage I cofferdam. Support facilities include a school with an attached gym, an 800 m$^2$ shopping centre, a public health building, an administration building, interfaith church and a 900 m$^2$ recreation centre which provides artificial ice for curling and skating and a 4-lane bowling alley. Service buildings include the sewage treatment plant, water storage and heating/recirculation buildings and a service station for car repairs and gasoline purchases. Radio and television programming is provided. The school will be operated by Frontier School Division. Health care will be provided by Gillam Hospital Services.

In most circumstances, construction workers will receive free air or surface transportation between Gillam and Winnipeg for workers from the south or between Gillam and their home community for workers from the north at time of hire and when they complete a tour of duty or are laid off.

### 3.5.3 Northern Employment and Business

Northern residents will be given hiring preference at the Limestone project if they satisfy the residency requirement. Hiring goals have been established for northern residents of native ancestry. Special recruiting, pre-employment training and apprenticeship programs are being implemented by the Government of Manitoba, with assistance from Manitoba Hydro, to give northern residents of native ancestry the greatest possible opportunity to participate in the Limestone project. A consultation process with northern communities, including Gillam and the Fox Lake Band, was carried out by the Government of Manitoba to obtain northerners' views about how to maximize their involvement in the Limestone project. The Government of Manitoba and Manitoba Hydro have also established special policies and measures to maximize northern business participation in the project.

## 3.6 LIMESTONE OPERATIONS

### 3.6.1 General

Limestone, with Kettle and Long Spruce, will be the third in a series of developments on the Lower Nelson River that benefit from the increased flows due to Churchill River Diversion. For the purposes of hydro-electric generation, Limestone will have the most regulated inflow of any Manitoba Hydro site. This has been facilitated by seasonal regulation from Lake Winnipeg and Southern Indian Lake and short term and daily regulation from Sipiwesk and Stephens Lakes, respectively. Lake Winnipeg in turn receives the benefits of upstream regulation of Lake of the Woods, Lac Seul and Cedar Lake, while Southern Indian Lake receives benefits from Reindeer Lake regulation. The Long Spruce Generating Station discharges directly into what will become the Limestone forebay and Limestone will generate a maximum of 1,330 MW of power from the rated head of 29.8 metres. The maximum output will decrease to 1,230 MW after the planned downstream Conawapa Generating Station has been constructed. Ponding up the Conawapa forebay is expected to raise the tailwater at Limestone 2.2 metres, which will reduce the Limestone head accordingly to 27.6 metres. Limestone will be of similar design to both Kettle and Long Spruce, and all three plants will be operated in parallel. Water levels in Limestone forebay will be fairly stable with an approximate 1.3 m range, and are not expected to fluctuate much differently than the levels in the Long Spruce forebay. All major fluctuations will continue to be provided by the Kettle forebay.

### 3.6.2 Forebay Levels

Comprehensive studies to determine the optimum forebay level at Limestone have indicated a maximum practicable level of 85.3 metres above sea level. The present interim license permits a maximum of 85.34 metres (280.0 feet). This represents an increase of approximately 30 metres over present water levels at Limestone. As a result of the Kettle-Long Spruce operations, with their daily (and weekly) peaking cycles, water levels at Limestone in its present (pre-ponded) state, fluctuate over a range of up to 4 metres. During Stage II cofferdamming, the water levels will be partly ponded and held to a very narrow range of a few centimetres by careful regulation of the Limestone spillway.

After commissioning of Limestone, with the forebay fully ponded, seasonal drawdowns of up to 3 metres may occasionally occur during periods of very restricted water supply, during maintenance of units at Long Spruce, or during the latter part of the winter to meet peak load demands. However, under normal operating conditions, which will prevail most of the time, the operation of Long Spruce and Limestone will be parallel, and the forebay will remain constant within an approximate 1.3 metre range.

In general, the forebay will slowly decline for about 16 hours from 7:00 until 23:00 on weekdays, and will partially recover over the 8 hours between 23:00 and 7:00 the next day. On a weekly basis, there will be progressive drawdown from Monday to Friday, with only partial recovery each night, with the balance of recovery over Saturday and Sunday.

Without the benefit of staging curves obtained from actual measurement (i.e., after commissioning of the generating station), it is difficult to predict forebay fluctuations accurately. The forebay fluctuates in response to numerous factors including Nelson River flows (which are affected by weather), system maintenance requirements and power demand (which can be affected by weather, export opportunities, etc.).

With the exception of discharge areas of certain tributary river valleys, the Limestone forebay will be largely confined within the natural banks of the Nelson River between Limestone and Long Spruce. At Limestone, the Nelson River is deeply entrenched in Paleozoic dolomitic limestone and Quaternary sediment deposits which will contain the approximate 30 metre average rise in water level. Due to the steep banks of the Nelson River, flooding will involve less than 300 hectares of land and will be limited to certain tributary river valleys. Flooding will occur on Brook's and Clements but will not occur on Sky Pilot and Wilson Creeks as they are immediately downstream of Long Spruce where expected flooding will raise water levels by about 2 metres. Sky Pilot and Wilson Creeks are ecologically sensitive brook trout spawning grounds (Gaboury 1978).

The banks of the Nelson River have been ice-scoured. They typically are seasonally devoid of vegetation up to the well-defined high-ice trim line. After flooding, the water level will remain within this cleared trim line except in close proximity to Limestone.

### 3.6.3 Discharge Rates

Downstream of the Limestone Generating Station, the tailwater elevation will be 51.9 to 57.1 metres (ASL) and the tailrace channel will vary in width from 265 to 520 metres. The discharge at Limestone will vary between 5,000 $m^3$/sec during maximum production and 475 $m^3$/sec at low demand times, during drought conditions. However, a maximum turbine flow of 5,000 $m^3$/sec will only occur at peak times when capacity on the system is in very short supply, a condition not likely to occur frequently. Typically, the daily maximum discharge will be 4,630 $m^3$/sec. This is almost identical to Long Spruce.

Because Limestone will be operating in concert with Long Spruce, there may be little further effect on the downstream reach of the Nelson River. In addition, operations at Limestone are not expected to influence operations at Long Spruce. Therefore, Limestone's effect on the Nelson River will be essentially confined to the forebay or the stretch of river between Limestone and Long Spruce.

### 3.6.4 Staff Requirements

The daily operations of the Limestone Generating Station, once completed, are expected to require a permanent staff of 28 with about 5 seasonal positions in the initial years. In addition, up to 8 trainee positions in various technician and tradesman positions may be established (Table 3-4). After the first few years, the number of permanent positions may be reduced by up to 4 positions and trainee positions may also decline. Permanent staff and trainees will be employees of Manitoba Hydro while seasonal staff may be Manitoba Hydro or contract employees. It is expected that the hiring of operating and maintenance personnel will begin in 1990 when the first generating unit goes on-line. By 1992, all 10 units will be operational and all staff will have been hired. Permanent positions consist largely of plant operators, electrical technicians, utility men and mechanical tradesmen.

### TABLE 3-4

### OPERATIONS PHASE STAFFING REQUIREMENTS

| | Initial Years | Subsequent Years |
|---|---|---|
| Permanent Positions | 28 | 24 to 28 |
| Trainees | up to 8 | up to 8 |
| Seasonal | 5 | 5 |

Source: Manitoba Hydro, 1984.

# Chapter 4

# CHAPTER 4

# BIOPHYSICAL ISSUES AND IMPACT MANAGEMENT

## 4.1 INTRODUCTION

The biophysical and ecological portion of the study examined project impacts and issues primarily of relevance to residents of communities in the Limestone Study Area, but which are also of concern within the wider provincial community. The emphasis was on issues and concerns potentially affecting people and institutions dependent upon local biologic resources, including local, provincial and international sportsmen. Addressing the impact of project workers who would come into the area as a result of the project was a major focus of the study. Non-local groups and individuals, including provincial and federal government biologists, the Manitoba Fly Fishermen's Association, and biologists throughout Canada, were consulted in the course of dealing with these concerns. For these reasons, the environmental portion of the study focused heavily on the present and likely future condition of area resources, as they would be affected by residents of both the permanent communities of Gillam and Bird, and workers in Sundance and the construction camp.

This chapter identifies potential biophysical impacts and issues and presents the recommended, priorized biophysical impact management program. Where appropriate, it outlines the evolution of each program through Phases 2 and 3 of the study.

## 4.2 ISSUES REQUIRING IMPACT MANAGEMENT - OVERVIEW OF PROCESS AND RESULTS

In the EIS Study Plan developed in Phase 1 of the study, various environmental issue areas were identified as potentially requiring a management response. During Phase 2, the study team endeavoured to assess each of these issue areas and determine the extent of impact management required. A combination of literature review, professional experience in assessing major project impacts, interviews with local residents during the liaison process and biologists throughout Canada was employed in this process. Technical information was analyzed about the project, the local setting, potential mitigation/enhancement measures and the experience from other and earlier projects, in particular, hydro-electric development of Long Spruce. Discussion Paper #2, which documented the Phase 2 analysis, identified the biophysical issue areas which required impact management, including associated monitoring requirements to aid long term impact management. In this detailed analysis, certain impacts identified earlier in the study were not considered to require further attention. There were several reasons why a number of potential issues were not studied further:

1. In many cases, appropriate mitigation measures have been implemented or are already planned by Manitoba Hydro, the Manitoba government and other groups to deal with potential problems (e.g., involvement of DNR Fisheries Branch staff in road construction and stream crossings during initial Limestone developments).
2. The area flooded by the project (<300 hectares) is relatively small, minimizing potential for adverse large scale areal impacts and associated impact management requirements.
3. Gillam natural resources personnel (i.e., local DNR staff) have previous experience with similar projects (i.e., Kettle, Long Spruce), making them better able to handle anticipated impacts.
4. Discussion Paper #3 was expressly designed to identify potential monitoring/mitigation strategies for discussion with resource managers, local interest groups and Manitoba Hydro. A major portion of these programs, especially those required to gather further pre-development information, or to minimize future impact (cf. Chapter 5), began in the summer of 1985.
5. Some issues are not amenable to any practical form of impact management.

The finalized list of impacts and issues requiring management is:

- implementation of comprehensive biophysical monitoring;
- impacts on anadromous brook trout;
- impacts on furbearers and ungulates;
- impacts on sturgeon;
- impacts on heritage resources;
- effects of aggregate exploitation;
- effects of flooding/erosion.

## 4.3 IMPLEMENTATION OF COMPREHENSIVE BIOPHYSICAL MONITORING

In the early phases of the study, considerable concern was expressed by resource managers, local residents, and other interested parties that pre- and post-development monitoring programs capable of identifying project impacts or the effectiveness of mitigation measures would actually be delivered or would be delivered in a timely fashion. This concern stems from experience with other projects (in Manitoba and across Canada), where pre- and post-development monitoring programs were generally not considered to have been adequately carried out (Hecky et.al. 1984, Beanlands and Duinker 1983). In this particular case, there was heightened concern, including that expressed at the National Energy Board's hearings in November 1984 regarding Limestone (Keeley Reporting Services Inc. 1984), that construction would begin before any additional pre-impoundment information could be obtained.

The consensus among the study team, provincial and federal government researchers, and all local groups consulted (e.g., Gillam Brook Trout Association, Gillam Fur Council) was that this was the key biophysical issue faced by project proponents. It was also agreed that a comprehensive monitoring program would lay the basis for systematic evaluation of the biophysical implications of further hydro developments on the Nelson River. Accordingly in Discussion Paper #3, a high priority was placed on commitment to the execution of appropriate monitoring programs. Information was (and continues to be) required to aid in identification of mitigation or enhancement opportunities, to monitor the effectiveness of implemented mitigation actions and to aid long term estimation of ecological impacts. The overall pre- and post-development monitoring program must be capable of:

- evaluating the effectiveness of implemented mitigation measures, including those specified in the Tender Specification to prospective contractors;
- providing information needed to assist choice of appropriate future mitigation/enhancement activities;
- refinement of recommended pre-development mitigation/enhancement measures;
- identifying and determining magnitude of residual longer term environmental impacts;
- provision of "baseline" information viz. future hydro-electric developments downstream on the Nelson River;
- verifying the low basis of concern regarding certain potential issues presently considered to require no impact management.

Satisfaction of these information needs requires both pre- and post-impoundment environmental monitoring.

The objectives of each specific monitoring program must be precisely defined and the delivery and financial agencies must be clearly identified (Hecky et.al. 1984, MacLaren Plansearch 1983). Provincial and federal personnel interviewed during the EIS agree that careful co-ordination of an annual monitoring program is essential to both cost-effectiveness and to satisfaction of information needs. The programs must provide information which responds to the concerns expressed, especially by those in the local area, and should respond to testable hypotheses (Beanlands & Duinker 1983, MacLaren Plansearch Inc. 1983) flowing, in part, from the EIS.

Timely initiation of a comprehensive program of environmental monitoring has been of immediate priority to the project proponents. Environmental impact began with the arrival of construction workers in Sundance and the construction camp in late summer of 1985. Monitoring of pre-impoundment environmental conditions was therefore required to begin in June and July 1985 and to persist thereafter as needed.

Mindful of these time constraints, Manitoba Hydro and the study team met frequently with provincial, federal and local interests during Phase 3 of the EIS to build consensus on required monitoring, likely timing, logistical considerations, and funding. Manitoba Hydro has committed to funding monitoring and mitigation costs, and provided initial project funding to ensure program initiation in June of 1985. Implementation of activities recommended in Discussion Paper #3 began in the summer of 1985 to maximize use of the pre-impoundment period, and will be discussed in subsequent portions of this chapter.

The specific nature of the recommended pre- and post-impoundment monitoring programs are detailed in the following sections. Responsibilities for program execution have been specified.

The existing provincial TAC technical review procedure should co-ordinate monitoring (and other impact mitigation) programs, and act as the forum for longer term review of monitoring and mitigation program results. TAC has indicated its willingness to fulfill this role, and discussions continue between Manitoba and Canada regarding federal participation throughout the life of the project (cf. Chapter 6).

## 4.4 IMPACTS ON ANADROMOUS BROOK TROUT

The impact of construction and operations on Nelson River anadromous brook trout populations[1/] (in the Nelson River and tributaries), a game fish considered a "heritage" provincial resource by the Department of Natural Resources, and highly prized by local and international sport fishermen, was identified as an important issue in Discussion Paper #2. The magnitude of this issue was confirmed by subsequent consultation with local (e.g., Gillam Brook Trout Association) and other groups (e.g., Manitoba Fly Fishermen's Association).

To a lesser extent, concern was also raised for non-anadromous brook trout and other freshwater fish species, principally by the Department of Natural Resources.

---

[1/] See p.78 for footnote.

The most important local tributary to the Nelson River capable of significant brook trout spawning and production is the Limestone River (Gaboury 1978), immediately downstream of the generating station. Relative to other salmonid-producing rivers in Canada, the Limestone River (and its associated tributaries) may be unique in the amount and quality of spawning and rearing salmonid habitat present[2/] (Personal Communication, Dr. K. Schiefer). The limitation of little over-wintering habitat in this and other local trout streams appears to explain the seasonal migration pattern of adult and juvenile brook trout, both anadromous and freshwater, down to the Nelson River after spawning each fall. Approximately one-quarter of these fish drift downstream as far as the estuary (Gaboury 1978, 1980), where rapid growth is enhanced in the rich brackish environment. For these "sea-run" fish, and for freshwater trout drifting out of the tributaries but not as far downstream as the estuary, anadromy appears to be adaptive behaviour in response to over-wintering and holding habitat limitations in lower tributary reaches. "Land-locked", freshwater trout reside in the semi-permanent pools created by beaver dams and debris in the upper reaches (Personal Communications, Dr. K. Schiefer, Mark Gaboury, Gary Swanson).

Information detailing the historic extent of anadromy within brook trout stocks spawning in local streams (e.g., Wilson Creek, Sky Pilot Creek, Sundance Creek, etc.) is limited. Provincial publications indicate the Kettle River was formerly (i.e., pre-Long Spruce) the furthest upstream habitat used by anadromous trout. This suggests that the Limestone area may now comprise the upstream limit of the lower Nelson River in which brook trout anadromy occurs.

The reproductive significance of anadromous female fish can be much greater than for freshwater females in some trout populations (e.g., more eggs, larger eggs, higher egg survivorship, etc.) (Personal Communication, Dr. K. Schiefer, Dr. M. Papst). In addition, non-anadromous females may spawn less frequently (e.g., every second year) than anadromous females in their northern range. For these reasons, relatively few anadromous fish can have an ecological productive importance

---

[2/] See p.78 for footnote.

greater than their numbers; this view is contingent with contemporary thinking that brook trout anadromy is environmental, and not genetically determined. These relationships need to be examined among brook trout stocks in the lower Nelson River. (Accordingly, DNR is conducting radio-tagged trout movement studies in tributary creeks; cf. Section 4.4.1).

The construction of the Limestone Stage I cofferdam may have reduced anadromous trout utilization of upstream tributary spawning habitat due to the very high water velocities in the mainstem near the cofferdam. Principal habitat use by anadromous trout may now be largely downstream of the cofferdam (Personal Communication, Dr. J. O'Connor).

In addition, limited information exists describing the strength or persistence of the anadromy instinct in brook trout, especially as feeding and migratory habitats undergo significant change viz. hydro-electric developments.

The impacts or sources of concern for anadromous brook trout include:

- probable reduced access to upstream spawning, rearing and over-wintering habitats (Sky Pilot Creek, Wilson Creek, Brooks Creek, Clements Creek), due to excessive Nelson River mainstem velocities near the cofferdam at present and precluded access in the future, due to the presence of the dam;
- loss of anadromous stocks produced by upstream spawning and rearing habitats;
- increased future angling pressure from construction workers, on populations presently thought to be at very low strengths, especially along the Limestone River (Personal Communication, Dr. J. O'Connor);
- flow/stage barriers limiting access to Limestone River spawning habitat on a probable weekly basis (cf. Crippen Acres 1985);
- turbidity and blasting effects on anadromous trout migrating to mouth of Limestone River in August-September during construction of the Stage Ia cofferdam;
- increased netting pressure from local Treaty Indians, due to the Bird community development near the Limestone River and non-local Treaty Indian workers living on-site who also wish to exercise their aboriginal harvesting rights;

- possible disturbance to creek discharge plumes immediately downstream of the cofferdam, which may interfere with the ability of migrating trout to "home" to their respective natal creeks to spawn (cf. Crippen Acres 1985).

Concerns for freshwater brook trout attempting to colonize the Limestone reservoir and associated tributary creeks (e.g., Sky Pilot Creek) arise from:

- possible changes in fish species composition in the reservoir resulting in more brook trout predators (e.g., pike) and competing fish species (Bodaly & Lesack 1984, Didiuk 1975, Green 1974, June 1971);
- change to a slower moving, deeper, lacustrine environment;
- changes in water quality adversely affecting primary production (Hecky & Guildford 1984) and benthic macroinvertebrates (Issom 1971, Aggus 1971, Wiens & Rosenberg 1984);
- period of trophic instability, and consequent general ecosystem ramifications (Hecky & Guildford 1984, Planas & Hecky 1984, Wiens and Rosenberg 1984, Bodaly et.al. 1984, Bodaly & Lesack 1984, Patalas & Salki 1984).

Eight groups of impact mitigation activities were identified in Discussion Paper #2 and discussed in Discussion Paper #3. They have been refined since, in extensive consultation with local interest groups (e.g., Gillam Brook Trout Association) and others (e.g., Manitoba Fly Fishermen's Association), including provincial (DNR) and federal (Department of Fisheries and Oceans (DFO)) scientists, and are discussed below. Many have been initiated by Manitoba Hydro (prior to the issuance of this Final Report), as recommended in Discussion Paper #3, to maximize use of the 1985 pre-development field season.

### 4.4.1 Ecological Monitoring

The systematic provision of new information is important to a long term program of impact management. While the data to be generated are important to mitigating Limestone-related impacts, they are of equal value in assisting pre-development planning viz. the proposed Conawapa and other generating stations downstream.

The principal initial focus is the 1985 and 1986 field programs. The three major recommended activities begun in these years are designed to generate short and longer term information which:

- describes the capacity of the Limestone forebay to sustain production of freshwater brook trout (by study of a similar, adjacent forebay environment almost a decade after construction);
- provides a comprehensive, ecosystem view of brook trout habitat types, qualities and production characteristics throughout the lower Nelson River. Within this comprehensive framework, the relative impacts on brook trout (and other fish species) of the Limestone (and any other future development) can be determined.

1. **Long Spruce Forebay and Tributaries (e.g., Kettle River) Study:**

- identify dominant species, determine abundance, distribution, age-class structure, growth rates, food chain relationships, morphometry, mercury content, etc.;
- determine presence of brook trout predator barrier viz. possible future upstream transport of anadromous brook trout;
- evaluate ecological changes in shift from riverine to more lacustrine environment;
- evaluate potential for stocking viz. observed species composition;
- delivery agency is DNR Fisheries Branch.

2. **Tributary Habitat Assessment:**

- evaluate amount, types, distribution, and quality of fish (especially trout) habitat upstream and downstream of cofferdam; habitat classification to be mapped using appropriate criteria (cf. Chamberlin 1980, Chamberlin 1981, deLeeuw 1981, Raleigh 1982);
- evaluate immediate need and prospects for habitat enhancement in selected tributaries (to compensate for loss of access to other habitats) (cf. IEC Beak Limited 1984);
- conduct bathymetric evaluation of the entrance to the Limestone River viz. potential for stage and/or flow constraints to upstream migration of brook trout during spawning runs, based on probably minimum tailrace elevations of 52 m ASL (cf. Crippen Acres 1985);

- establish basis for assessing future incremental developments (e.g., roads, stream crossings, transmission lines, downstream dams, etc.), using knowledge of characteristic habitat production throughout the lower Nelson River system, in the context of the total downstream ecosystem;
- primary delivery agencies are Manitoba Hydro and DNR.

3. **Fish Population Studies in Major Tributaries:**

- determine species composition, production, distribution, age-class structure, strontium and mercury content, growth rates, etc. for specific habitat classes, in major trout producing tributaries;
- temporal and spatial movement patterns, and extent of habitat utilization, especially in anadromous fish;
- primary delivery agency is DNR Fisheries Branch.

Such studies will help, among other things, to determine:

- if the present population structure in certain tributaries (e.g., Sky Pilot Creek) is "typical" or different from its character when last studied (e.g., 1978), to see if populations have restored or maintained themselves after the departure of a large, hydro-related transient workforce;
- whether other limitations than limited over-wintering habitat are constraining brook trout production.

These three recommended studies funded by Manitoba Hydro, were begun in June 1985 and were carried out by Manitoba Hydro and DNR Fisheries Branch, using local labour where appropriate. They will be maintained in 1986 and subsequent years, as co-ordinated and advised by the TAC. Initial results suggest the following:

- little freshwater brook trout survival upstream of the Long Spruce dam, in the forebay and the Kettle River;
- marginal recovery of brook trout populations in Sky Pilot and Wilson Creeks since completion of the Long Spruce project upstream, and departure of the temporary workforce;
- very few adult (>3 years) brook trout in tributaries of the Nelson River downstream of the Long Spruce dam, especially in the Limestone River;
- resident freshwater and transient anadromous fish, in Moondance, Tiny and Swift Creeks downstream of the Limestone dam site;

- probable stage constraints of 52.0 m tailrace elevations at the mouth of the Limestone River, for migratory brook trout attempting to move nocturnally upriver during the spawning season.

In 1986, recommended fisheries monitoring will include:

- continuing studies of Long Spruce forebay (including estimates of spillway and turbine mortality);
- continuing assessment of downstream habitat, use, population distribution and behaviour;
- detailed studies of stage and flows at the mouth of the Limestone River during critical spawning periods, to identify the frequency of constraints to upstream migrant fish during minimum discharge and low tailrace periods;
- assessment of sturgeon habitat type, quality, distribution and use in the downstream reach of the Nelson River mainstem.

In subsequent years, fisheries monitoring will complete development of a pre-impoundment database, and a TAC-administered post-construction program will subsequently be carried out to determine the presence and the magnitude of ecological changes. Post-impoundment studies will be integrated in or compatible with relevant pre-Conawapa studies which may be required. Throughout the monitoring program, utilization of local assistance and knowledge will continue to be maximized where possible.

### 4.4.2 Tributary Enhancement

Mitigative measures to maintain or improve brook trout (and other species) habitat, particularly for spawning and juvenile rearing, may be initiated in 1987 if warranted by data generated by the above-mentioned activities. Where possible, the objective would be to enhance habitat and production potential in the smaller downstream tributaries. This would attempt to reduce pressure on the Limestone River, the major fish protein source for members of the adjacent Fox Lake Indian Band at Bird, and the preferred regional sport fishing location, and to compensate somewhat for lost production upstream of the dam.

Smaller scale measures are favoured (e.g., streamside and channel improvements to increase riffle and pool habitats, debris removal to reduce constraints to upstream fish passage, etc.). Feasibility is difficult to estimate without the data to be generated this summer and in 1986. Final implementation responsibility rests with DNR.

### 4.4.3 Increased DNR Enforcement

Early results from the 1985 population studies conducted by DNR in key local tributaries indicate that as few as 500± brook trout may be in the region, less than 10 per cent of which would be the larger gamefish prized by local and international anglers (Personal Communication, Dr. J. O'Connor). Fishing pressures on brook trout, already high and of concern to local sportsmen and DNR biologists (Personal Communication, Don Cook), were expected to increase beginning in the late summer of 1985, with the initial influx of construction workers.

Enforcement activities cover the issuing of licenses, establishment of length of fishing seasons, determination and enforcement of quotas or limits and the surveillance of fishing. All will require review as fishing pressures increase. Changes in regulations may also be needed. Currently, the major limitation in effective regulation and habitat protection is the low number of Conservation Officers in the region, and their wide mandate. Fishery enforcement is not always a priority, especially during the late summer/early fall spawning season (Personal Communication, Don Maxwell). As indicated in Discussion Paper #3, the study team recommends:

1. **Improved Enforcement:**
   - placement of a new Resources Enforcement Officer position at the job site, whose principal responsibility is fishery regulation enforcement (although the position will add to protection of wildlife resources as well) and related activities; Manitoba Hydro has agreed to provide the annual salary (expenses will be covered by DNR) when the 6-year position begins this winter in fiscal 1985; less qualified supplementary staff may also be required to assist the NRO, likely for 5 years, beginning in fiscal 1986;

- temporary or permanent increases in DNR CO staff (e.g., relocation of existing personnel, hiring new, temporary staff with specific non-enforcement selected duties, e.g., assistants in fire suppression);
- larger budget for local aerial patrols; particular focus to be surveillance of proposed "Reproductive Sanctuaries" (see below).

2. **Changes in DNR Fishery Regulations:**

- complete closure of the Limestone River brook trout angling season for each year for the next three years, until after the departure of the peak construction workforce;
- as dictated by monitoring results for all other tributaries, reductions in brook trout catch limits, season length, etc.;
- selective regulated dispersal of angling effort among key tributaries (e.g., only one adult trout per stream).

3. **Other Measures:**

- designation (and associated extensive announcement) of special status "Brook Trout Reproductive Santuaries" in the upstream portions of principal tributaries, especially the Limestone River, as has been successfully done to maintain threatened salmonid stocks in the Great Lakes (Personal Communication, Dr. K. Schiefer);
- limit number and location of access roads built (e.g., to borrow pits);
- closure of access roads following pit depletion.

### 4.4.4 Site Environmental Inspection

Road building, stream crossings, borrow pit development and debris deposition from waste rock disposal in the Nelson River may adversely affect trout (and other fish) populations. Impacts may arise from increased access for anglers, blockage of fish passages, siltation and destruction of spawning grounds and habitat, direct mortality, disruption of migration, etc. There is substantial potential to manage construction activities to minimize environmental disruption.

The principal mitigative measure recommended in Discussion Paper #3 was hiring of an on-site Environmental Inspector, beginning activity in the last half of fiscal 1985, to aid Manitoba Hydro in assisting the contractor to ensure adherence to tender specifications and to guidelines for stream crossings, borrow pit construction, road and other construction activities. When not fully utilized in site inspection, it was contemplated that the Environmental Inspector would also assist the NRO on-site in other duties (e.g., protecting wildlife resources) and in various environmental education programs. In particular, where guidelines are non-existent or unclear, consultative processes with Fisheries Branch and other environmental agencies were seen to be initiated and maintained by the Inspector. It was recommended that the position be maintained for a total of 6 consecutive years, beginning in 1985.

Since release of Discussion Paper #3, Manitoba Hydro has endorsed the concept and is presently exploring the various ways in which the recommended Environmental Inspection function can best be delivered. Manitoba Hydro has consulted with the Chairman of TAC and senior DNR personnel in establishing the most appropriate method of delivery of the recommended function. Currently, it is anticipated that Hydro's most senior official at the Limestone site, i.e., the Resident Manager, will assume responsibility for the inspection function and will delegate tasks among senior on-site Hydro personnel. Manitoba Hydro intends to supply regular reports documenting the execution of the inspection function to the Chairman of TAC, beginning in December, 1985.

### 4.4.5 Protection of Limestone River Stocks

Additional pressure on the Limestone River fish populations will become apparent because of the proximity of the river to the construction site, the Bird development, and demands from local groups (e.g., LGD of Gillam, Gillam Brook Trout Association) for increased recreation. The main types of anticipated effects are:

- physical barrier to nocturnal upriver migration imposed by low tailrace water levels (minimum = 52.0 m ASL) immediately below the dam (e.g., during forebay ponding each weekend);
- disruption of the Limestone River dispersion plume as a "homing" guide to migratory fish (cf. Crippen Acres 1985);
- possible velocity and turbulence barriers near the Limestone River mouth;
- possible blasting and rock disposal effects during construction;
- increasing angling pressure and illegal fishing.

Recommended potential mitigation actions include:

- closure of the Limestone River brook trout angling fishery in 1986, 1987, and 1988 (as previously discussed);
- studying the utility of a protective rock barrier to reduce turbulence and velocity effects near the mouth of the Limestone River; modelling studies could require other investigations;
- maintenance of the existing option for fish access through the quarry cofferdam (until used by quarrying during Conawapa construction);
- depending on the results of the river outlet bathymetric study, consideration of lowering the rock sill at the Limestone River mouth to maintain minimum water levels > 52 m ASL, to ensure nocturnal upriver fish passage into the Limestone River. Such considerations would likely occur in fiscal year 1987, pending the results of studies of the frequency of stage constraints to migration;
- planning Stage Ia cofferdam construction and associated waste rock disposal to ensure that activities occur as far from the mouth of the Limestone River as possible during the fall trout spawning run, especially during night shifts;
- upon receipt of the data to be generated by the aforementioned forebay and tributary monitoring programs, detailed consideration (jointly by Manitoba Hydro and DNR) of the flow regulation concept, to identify critical minimum in-stream water levels or flows at important time periods, either for important species downstream of the dam (e.g., migrant trout, sturgeon) or species dominant within the Limestone forebay; likely to occur in fiscal 1987.

### 4.4.6 Environmental Education

An educational program, primarily but not exclusively focusing on the regionally scarce brook trout should be developed by Manitoba-Hydro (in consultation with DNR and the Fox Lake Band) to foster environmental sensitivity and conservation values. Targeted to the residents of Gillam, Bird, Sundance and the construction camp, the program should also incorporate information pertinent to other sensitive or valuable species. The program should run annually for 6 years, beginning in fiscal 1985. The Resources Enforcement Officer (NRO) and the Environmental Inspection program should assist Hydro in the delivery of this program.

Discussion Paper #3 also recommended that this educational information program urge consideration by Treaty Indians working on the project (both local and non-local) to voluntarily waive their treaty fishing rights, in recognition of the need to preserve the resource, and hence the value of treaty fishing rights, over the long term. Since issuance of the paper, all federal and provincial biologists and resource managers have endorsed emphasis on education regarding this topic, noting that it could contribute to preserving the opportunity for local Treaty Indians to fish.

### 4.4.7 Fish Stocking

The stocking of salmonid fry is recommended to improve production of fry and yearlings in a system which displays a relative scarcity of quality spawning and over-wintering habitats. Discussion Paper #2 recommended stocking be considered for certain depleted borrow pits (upon excavation below the water-table), and for the Limestone forebay and tributary creeks upstream and downstream of the dam. In their response to the Paper, the Fox Lake Band and federal DFO scientists endorsed study of the stocking option for depleted borrow pits and for the Limestone forebay. However, DFO personnel urged that natural selection be encouraged and enhanced if monitoring studies indicated post-development recruitment by preferred species in the forebay tributaries (Personal Communication, Dr. M. Papst). In response to Discussion Paper #3, wherein stocking was recommended for controlled situations (e.g., depleted pits) and underutilized juvenile rearing habitats, provincial DNR-Fisheries Branch personnel asserted their responsibility to specify acceptable stocking species (Personal Communication, Dr. J. O'Connor). Further dialogue with provincial and federal fisheries experts is required to determine the feasibility of these options, as data from the recommended monitoring programs are forthcoming. Choice of species is likely a matter for consideration by both DNR and DFO scientists, and will ultimately rest with DNR.

Production of salmonid fry for stocking is technically without constraint (Liaw 1981a, 1984b, Papst & Hopky 1982, Papst & Hopky 1983, Tabachek 1984). Artificial substrate egg incubation in particular is an inexpensive, non-experimental technique ideally suited for systems with limited spawning and over-wintering habitats (Personal Communication, Dr. K. Schieffer). The technique focuses on a desirable local species, and allows natural selection forces to exert themselves on the released fry in stocked creeks or rivers, thereby maintaining "normal" stresses on that gene pool. The only likely limitation to stocking of tributaries will be the availability of good quality rearing habitat not already populated by juveniles and therefore available for colonization by the hatched fry (Anon. 1980). The recommended tributary studies will identify stocking opportunities. In addition, initial results of studies in Moondance and other creeks suggest that stocking of native brook trout fry upstream of permanent beaver ponds or other barriers to downstream drift may be feasible. Populations in these upstream bog habitats, created by a series of permanent (upstream) and semi-permanent (downstream) beaver dams cannot be replenished from downstream by anadromous or freshwater migrants (Personal Communication, M. Gaboury). Opportunities may therefore exist for stocking, to compensate for limitations in reproductive habitat in these bog pool habitats, if over-wintering habitat is present. Continuing DNR monitoring and future tributary habitat classification studies (possibly by Manitoba Hydro assisted by DNR) will identify such stocking opportunities.

### 4.4.8 Fish Transport

At this time, the only fish passage measure amenable to consideration for practical mitigation of upstream migration blockage is the fish transport ("trap and truck") option. Fishways were not considered in Discussion Paper #2 because a major provincial Fisheries Branch study (Gaboury 1978) and the Lower Nelson Overview Study (1981) indicated that a fishladder could not be justified. In addition, information is limited in evaluating the extent of upstream anadromy and the persistence of the homing instinct.

Ecological monitoring of the Long Spruce forebay and associated tributaries (cf. Section 2.3.1) in 1985 and 1986 will yield data indicating whether a predatory barrier is likely to exist in the Limestone forebay. Initial 1985 results suggest this may be the case (Personal Communication, Dr. J. O'Connor). These (and other monitoring) data should subsequently be assessed by provincial DNR, federal DFO, and others to:

- identify considerations specific to the Limestone site and the applicability of species composition (and other) data from other relevant studies;
- evaluate the practicality of the post-construction, "trap and truck" transport measure;
- if appropriate, make recommendations on the design, and operation of such a transport measure;
- assist in the definition of the need for provision of fish passage measures on the proposed downstream Conawapa station.

If monitoring results indicate the potential need for downstream fish passage, research will be needed well before engineering design of the Conawapa station to develop criteria for upstream and downstream fishway design (cf. Didiuk 1975), viz. attraction, repulsion, etc. (e.g., slope, water velocity, use of lights, sonics, etc.) (Personal Communications, Dr. P. Patrick, Dr. K. Schiefer, Dr. P. Ruggles). Such factors are highly influential to successful design (Weaver 1963), and are often tested in working prototypes before engineering details are finalized (cf. Schwalme and MacKay 1985).

To expedite the dialogue among the foregoing authorities requires that DNR monitoring data from 1985 to 1986 be analyzed, integrated, interpreted and made available to Manitoba Hydro in the spring of 1987.

## 4.5 IMPACTS ON FURBEARERS AND UNGULATES

The principal wildlife species of concern are beaver, muskrat, lynx, foxes, wolves, moose and caribou. Bears may become cause for concern if increased human habitation and inadequate solid waste management in the area results in greater attraction to the townsite, work camp, etc.

Increased recreational and illegal hunting, trapping, noise and disturbance during the construction and operations phases of the project, are frequently associated with the unregulated use of all-terrain vehicles (ATV's) and aircraft. They are likely responsible for the greatest effects on wildlife, and have been identified as causes of concern associated with hydro-electric development for the past decade (Didiuk 1975). These impacts are of concern to those local people wishing to preserve both the extent of the harvest which occurs now, and the opportunity to harvest once project construction is complete (e.g., Gillam Fur Council). The impacts are aggravated by increased access to previous remote areas, attributable to the project (Personal Communications, D. Maxwell, Gillam Fur Council).

Habitat loss in the forebay through flooding will be minimal since the existing shorelines of the proposed reservoir presents little productive habitat (Didiuk 1975). Forebay and downstream habitat will be affected by water level variation; trapline access may be affected by water level variation and associated effects, especially at the mouths of the Limestone River and Moondance Creek. Some habitat may be lost through road construction. These impacts are of particular concern to the Gillam Fur Council.

Specifically, the concerns raised are as follows:

1. **Lynx:**

   - noise and disturbance of construction activity are likely to drive lynx, which are very sensitive to noise, away. Since Long Spruce construction began, trappers have noted a decline in the lynx population which they attribute to construction and recreation activity (helicopters, ATV's, roads, etc.) (Personal Communication, J. Lockhart); the decline is also attributable to the natural population cycle in response to population cycles of prey species;
   - recreational demands of construction workers are likely to conflict with the needs of trappers. The increased presence of snowmobiles and all-terrain vehicles associated with both recreation and construction will likely force the lynx further away into remote areas;
   - because the heavy bush close to creeks is the preferred lynx habitat, lynx have little favoured habitat to which to retreat;
   - the result of pushing lynx populations further from the local areas is reduction in income for trappers who normally take the species. (Closure of lynx seasons at the low point in population cycles (e.g., 1985-1986) will, however, have a more direct effect on income than declines due to disturbance.)

2. **Beaver:**

   - operational flow variations may affect the viability of existing beaver lodges in selected tributaries within and immediately downstream of the forebay and may ultimately hurt the beaver population. Beaver may be displaced, probably moving upstream along creeks where they can attempt to control water levels (Didiuk 1975);
   - if beavers are bank dwellers, as along Angling River, they may not survive water fluctuations (Personal Communication, B. Monkman);
   - dam construction may limit the range of habitat for beavers, which are reported to come up the Nelson River as far as Long Spruce;
   - for trappers, possible movement of beavers further afield requires an increased effort, and therefore costs, to maintain the beaver harvest.

3. **Muskrats:**

- muskrats are greatly affected by operational flow variations, especially when variations are on a regular basis (Personal Communication, B. Monkman). The population may be reduced and displaced, increasing trapper effort and reducing income.

4. **Foxes and Wolves:**

- foxes will likely become more abundant with an increased local population. Foxes will likely be attracted to the garbage dump. However, it is likely that the number of road kills, often deliberate according to local trappers, will also increase (Didiuk 1975), representing a loss of potential income to the trapper within whose Registered Trap Line (RTL) the fox was killed;
- although wolves are not very abundant in the local area now, they may be attracted to garbage generated. When starving, in the past, they have preyed on domestic dogs, e.g., at Sundance (Personal Communications, J. Lockhart, D. Maxwell).

5. **Bears:**

- like foxes, bears will likely be attracted to the camp or townsite if a high level of commitment to solid waste management is not evident in these areas.

6. **Moose:**

- the most significant impact on moose populations will be the increased recreational hunting pressure from construction workers. Workers in their leisure time, may exert significant pressure on the population. Demand may be greater during Limestone construction than during Long Spruce construction if the work rotation results in more recreation time being available to workers;
- moose populations in the choicest areas which moose tend to congregate in, especially in winter (Personal Communication, L. Bowles), are likely to be affected. Currently, hunters must travel 50 to 65 km (30 to 40 miles) to reach good moose habitat. Construction workers during Long Spruce bought and rented planes to access moose and other resource populations for recreation hunting purposes, while those local people wishing to harvest the moose for domestic food were forced to travel by snowmobile for the same resource (Personal Communication, E. Zelenisky). This potential conflict between domestic and recreational use has potential to reoccur (Personal Communication, R. Clinton);
- aircraft harrassment of ungulates has been reported, resulting

in separation of calves from their mothers and associated increased vulnerability to predators (Didiuk 1975);

- use of planes to access hunting areas compounds the already difficult enforcement task of the local Resources Branch, increasing the opportunity for illegal harvest, and increasing stress on the populations further away from the project area.

7. **Caribou:**

- because caribou habitat is more plentiful than moose habitat (Didiuk 1975), and because caribou are less gregarious than moose and, except during migration, tend to be dispersed over wider areas (Personal Communication, V. Chrichton), the potential for significant project-related effects is less than for moose, but is nonetheless worthy of consideration. The ease of harvest once caribou are encountered is of concern, especially with respect to possible de-stabilization of regional populations (Personal Communication, L. Bowles).

### 4.5.1 Monitoring

An annual aerial survey of furbearer habitat is required for two more (i.e., after 1985) years preceding impoundment and for at least 5 years (not necessarily consecutive) after development. Subsequent population monitoring by DNR would then be based on the comprehensive habitat classification and assessment. Habitat production potential can then be evaluated from yield data, field determination of habitat quality, utilization, etc. Habitat classification was recommended in Discussion Paper #3 to be initiated in 1985, and DNR and Manitoba Hydro have recently agreed on an aerial survey for November 1985. Monitoring will be most effective with local trapper involvement in aerial surveys, as was done in 1984 in the moose habitat mapping program (Personal Communication, L. Bowles). Members of the Gillam Fur Council expressed interest in such participation in the response to Discussion Paper #3.

Four intermittent (i.e., every other year) aerial counts of caribou and moose populations near the study area are recommended, beginning in 1985. The caribou herd distribution and habitat use was last studied in 1972 (Larche 1972).

### 4.5.2 Increased DNR Enforcement

Enforcement of hunting and trapping regulations is presently hindered by the small staff complement, conflicting responsibilities, and budget limitations of regional Conservation Office staff. Increased staff and budgets are recommended to allow for more frequent aerial and road patrols, etc. Recommended mitigation options (assuming placement of the Resource Enforcement Officer - cf. Section 4.4.3) include:

- DNR monitoring of chartered aircraft use (especially re: reports of animal harrassment from the air) and key access roads during hunting season;
- establishment of 300 m road border no-hunting, no-trapping refuges along selected roadways of concern.

### 4.5.3 Trapper Training

A DNR trapper training program in the local area is recommended and would provide a longer term, community-oriented mitigation measure by enhancing resource utilization and production in unaffected areas. This measure is also strongly recommended by the Gillam Fur Council. The general objectives of such a program would be to:

- increase trapper participation in furbearer management programs;
- improve trapping skills, especially in younger trappers;
- improve the quality of fur presentation/preparation for marketing;
- improved understanding of furbearer biology, especially responses to controlled harvesting and other forms of management.

The program could include topics ranging from trapping techniques to resource management, marketing, etc. It could include courses taught at an experimental trapline established for this purpose, as exists in the south.

### 4.5.4 Construction and Hydro Worker Education

An educational program focusing on furbearer biology, present vulnerability, and the local community impact of illegal trapping will be most effective as part of a larger education program aimed at fostering protective attitudes towards local wildlife. It is also recommended by the Gillam Fur Council. Such a program would explain the great importance of trapping as a local livelihood. Appropriate rules and regulations and conduct should be clearly delineated for the workers on an ongoing basis, particularly during their initial orientation upon arrival at camp.

Upon arrival in the Manitoba Hydro camp, all workers should receive informative material on the highly stressed nature of local furbearer and ungulate resources; Treaty Indians should be urged in these pamphlets not to exercise their Treaty rights to harvest local biotic resources, in order to preserve the resources (and hence the value of aboriginal harvesting rights) throughout the length of the construction period.

### 4.5.5 Habitat Enhancement

Furbearer habitat enhancement (e.g., Weir construction) should be initiated where possible to mitigate the negative effects of sustained drawdown or flooding of tributaries, and also to enhance production in unaffected areas. The Gillam Fur Council urges that enhancement be aimed at aquatic species most severely impacted by habitat changes, and most responsive to improvements (e.g., beaver). Borrow pits may be revegetated by the Contractor upon depletion, creating some moderately useful habitat for terrestrial furbearer prey species (e.g, hares). Activities should be initiated in 1987, following habitat surveys.

### 4.5.6 Development of a Compensation Program

Through present and future discussions with Gillam Fur Council and provincial DNR fur managers, consensus should be reached on the need for compensation of any demonstrated negative impacts on furbearers. Compensation for project-related loss or impairment of livelihood, if proven valid, should preferably occur through non-monetary programs such as trapper training, improved enforcement, habitat improvements, etc. (Personal Communication, J. Lockhart, B. Monkman). Various incentives could be considered to compensate for the greater travel time and decreased harvest if demonstrated effects occur as a result of disturbance.

### 4.5.7 Management of Camp Garbage and Hazardous Materials

Foxes, bears and wolves may be attracted to camp and Sundance garbage sites, particularly at the end of winter. This will increase the opportunity for illegal trapping and hunting (Didiuk 1975). Recommended mitigation includes:

- careful garbage management by the camp caterer and townsite manager (per Clean Environment Commission Orders) to minimize attraction of animals;
- strict control of the use of herbicides, per Clean Environment Commission Orders.

Implementation of the foregoing has been done by Manitoba Hydro in the past, and should be expedited in the future by the proposed NRO and the Environmental Inspection program.

## 4.6 IMPACTS ON STURGEON

The most important issue in relation to sturgeon is the implications of the project for the survival of the species (Didiuk 1975). Determination of negative impacts on the sturgeon is complicated by the sturgeon's slow growth and low reproductive rate (Harkness and Dymond 1961), and the lack of biological knowledge of the species and their critical habitat requirements in the lower Nelson River. Specifically, the following information is required:

- follow-up studies to original work (Sunde 1959, 1961) on sturgeon biology (especially length, weight, and age relationships, condition factors, diet, etc.) in Nelson River, focusing on lower Nelson habitats;

- information on spawning locations, behaviour, timing, conditions, etc.;
- distribution (density, seasonality) above and below Limestone Rapids;
- catch-per-unit-effort if feasible to measure;
- effects of previous hydro-electric developments on habitat use, reproduction.

The incremental effects of the Limestone project on a species affected to an unknown extent by previous developments on the Nelson River, are presently unknown and cannot be predicted without additional data.

The principal areas of concern are:

- impact of water level variations on spawning, causing elimination of recruitment (Didiuk 1975);
- construction effects, principally siltation of spawning grounds;
- segregation and isolation of sturgeon populations as the river is progressively segmented by consecutive dam developments (e.g., Conawapa, Gillam Island);
- adequacy of habitat for all life stages of sturgeon within each reservoir;
- mortality at turbines, particularly for juvenile sturgeon moving downstream;
- changes in benthic fauna associated with operations, favouring production of pike or walleye at the expense of sturgeon.

Six mitigation measures are proposed, and outlined in the next sections.

### 4.6.1 Monitoring

In conversations with DNR Fisheries Branch in Phase 3 of the EIS, prior to initiation of habitat and population studies recommended in Discussion Paper #3, index gill netting in the Long Spruce forebay (cf. Section 4.4.1) was recommended to include a mesh size in the standard gangs suited to sturgeon capture, to see if forebay-adapted sub-populations exist.

Initial results of the summer program in 1985 indicate an absence of sturgeon in this forebay (Personal Communication, Dr. J. O'Connor), verifying the concerns for survival of the species upstream of regulatory structures and dams.

Initial location and assessment of potential sturgeon spawning areas is required in 1986 for the lower Nelson between the Limestone cofferdam and the Weir River. The assessment should be based on helicopter reconnaissance (and ground truthing) of areas exhibiting the appropriate combination of flow, depth, substrate, water clarity, etc. A subsequent ground survey during the suspected spawning period in 1986 would confirm habitat potential, evaluate habitat use, and estimate spawning effort. In future, these data will be important in assessing incremental biological effects of a proposed Conawapa station.

### 4.6.2 Flow Regulation

Based on the results of spawning studies, a critical range of water depths and flows should be identified for selected spawning areas. The concept of a minimum discharge during the spawning season required to maintain these flows and levels should then be evaluated by Manitoba Hydro and DNR Fisheries Branch, with the view to ensuring the survival of the species in the lower Nelson system.

### 4.6.3 Fishing Regulation

The prevention of over-exploitation is essential, given the long maturation period, low reproductive rate of sturgeon, and apparently low population levels in the Nelson River at this time (from DNR sturgeon production records). The impact of the construction and operation of the Limestone generating station will not be apparent for many years, and present fishing effort is minimal. Accordingly, reduction in fishing pressure is an important, highly cost-effective protective measure. Recommended actions include:

- complete closure of angling season for 20 consecutive years (ie., one minimum reproductive cycle) (Sunde 1961);
- closure of commercial fishing in Management Unit 5 (only one little-used license at present) for 20 years;
- improved enforcement of such changed regulations;
- if angling is in fact to be permitted, requirements for all anglers to bring aging structures to DNR, along with information on size, weight, and location of catch.

### 4.6.4 Site Environmental Inspection

Construction activities likely to negatively affect sturgeon below the Limestone site include water level changes, possible siltation of spawning grounds and alteration of water chemistry. The former change is likely the most significant. These may affect both spawning activity and food availability. Several remedial actions should be implemented, including the following:

- downstream siltation during construction associated with waste rock disposal must be monitored by provincial (EMD) water quality studies beginning in 1986. Waste rock deposition during the spawning period should be managed to minimize deposition and downstream siltation;
- Department of Natural Resources (DNR) staff should net out all trapped sturgeon behind the dewatered Stage Ia cofferdam and return them to the Nelson River mainstem.

### 4.6.5 Habitat Enhancement

Following the location of spawning beds (cf. Section 2.5.1) and the assessment of spawning success, spawning habitat could be improved or created if necessary in 1987 or 1988. Careful placement of blast rock below tailraces or spillways at other power dams has provided excellent spawning habitat for sturgeon (and for other game and forage fish species) (Personal Communication, Dr. K. Schiefer). A DNR-administered study program should occur on a one-time basis to evaluate the utility of this possible mitigation measure.

### 4.6.6 Education

A public educational program expedited in the local area by Manitoba Hydro about vulnerability of the sturgeon to development effects is desirable, especially if angling restrictions are enacted, and should be co-ordinated with other such programs (cf. Section 4.4.6).

## 4.7 IMPACTS ON HERITAGE RESOURCES

Discussion Paper #2 distinguished pre-historic and historic resources in recommending various mitigation efforts. Due to the high potential for impact, pre-historic resource impacts were regarded as an issue requiring impact management. By contrast, impact on historic resources was regarded as not requiring impact management, due primarily to the mitigative measures already in place (e.g., protected gravesites at Limestone Camp) and the perception that there would be no further impact. After further reflection and discussions with Historic Resources Branch in Phase 3 of the EIS, this distinction was dispensed with. Concern for both kinds of resources is implicit herein.

Preliminary Limestone project development and construction has proceeded with relatively little prior assessment of heritage resources, especially those associated with the forebay perimeter and potential borrow areas, which are considered to have potential for recovery of heritage resource materials. Only one short winter study (Riddle 1975) has been conducted. The impact of development activities in some areas is now difficult to assess precisely, as some construction-related impact has already occurred. However, all areas still warrant an assessment and a detailed program focusing on high potential areas is required. High potential areas and other areas of concern include the following:

- river-banks, especially those marking the confluence of rivers, are often rich with heritage materials bedded in surface soils;

- granular deposits, by virtue of their well-drained character, often have high potential for recovery of pre-historic materials;
- borrow pit excavation as proposed during construction has the potential to disturb pre-historic heritage resources. The likelihood of borrow pits being archaeological sites is quite high since their well-drained materials and relatively easy excavation made them attractive to ancient peoples as burial grounds;
- borrow pit exploitation will require upgrading of several trails, which may also harbour pre-historic heritage materials along their edges (Personal Communication, G. Dickson).

The onset of construction activities in late summer 1985, viz. development of borrow pits and associated access roads had relatively high potential for disturbance of heritage materials, requiring immediate field assessment.

In June 1985, prior to initiation of borrow pit development by the General Civil Contractor, preliminary reconnaissance in these areas was conducted by Quaternary Consultants Ltd. as part of the phased mitigative field program recommended in Discussion Paper #2.(No significant heritage resource materials were found in borrow pits scheduled for first development). This resulted in the design and the execution (in August 1985) of a detailed mitigation salvage program for areas where remaining 1985 efforts should be focused. Required follow-up mitigative recovery work for the 1986 field season, likely focusing on the forebay perimeter and flooded areas in Brooks and Clements Creeks, was identified in a report submitted to Manitoba Hydro and the provincial Historic Resources Branch (MacLaren Plansearch Inc. 1985).

## 4.8 EFFECTS OF AGGREGATE EXPLOITATION

Alterations to the biophysical environment will arise from the excavation and transport of material from borrow pits to meet the large aggregate requirements of dam construction. Several potential impacts on aquatic habitats were identified in Discussion Paper #2, including:

- possible damage to Moondance Creek (productive fish, beaver and muskrat habitat), if adjacent pits are selected for use by the contractor;
- depending on the course of action chosen by the contractor, building of roads to access pits on the north side of the Limestone River (Bird I, II and III), possibly involving a new bridge.

The proposed Environmental Inspection program will assist Manitoba Hydro and the contractor to ensure that establishment of aggregate washing facilities and other operations raise no concerns about environmental protection.

Specific protective guidelines and requirements regarding general borrow pit operations, road and bridge building, aggregate washing and waste rock disposal were discussed in Discussion Paper #'s 2 and 3. Many were also included in the contractor's specification documents, issued to prospective bidders prior to release of Discussion Paper #2. The following lists the range of recommended protective measures contained in the various documents, and recommended by the study team:

**In General:**

- stockpiling of stripped soil and vegetation (where possible) for use in rehabilitation of pits after termination of borrow operations;
- no clearing of vegetation, excavation or stockpiling of material to be undertaken within 100 metres (320 feet) of a natural water body, including a river or stream. This buffer zone will prevent direct runoff and subsequent erosion. Subsequently, various work permits and addenda issued in October 1985 by DNR specify more site-specific buffer zones, affording appropriate protection;
- if practical, ensuring that the shape and dimensions of depleted borrow pits be such as to create fish habitat and enhance fish production therein.

**Re: Road and Bridge Building:**

- to conform to "Recommended Fish Protection Procedures for Stream Crossings in Manitoba", as per Tender Specification No. 1800 (item 8), the contractor must contact the Regional Fisheries Manager prior to initiation of construction activity in order that environmentally sensitive areas may be identified and avoided;

- when road building, high water table areas, organic soils related to depression topography, till plains (sensitive to disturbance) and glaciolacustrine deposits of silty/clayey soils should be avoided as per the Stream Crossing Guidelines, any blocking of natural drainage with road bed must be precluded, and stream crossings should be chosen as far upstream from a river mouth and as far downstream from a lake outlet as possible (at least 500 metres, 1,600 feet); in addition, construction of stream crossings and bridges should occur during the winter, bridge construction should minimize bank erosion, (to preclude siltation of spawning beds) and culvert or bridge openings must be able to handle a one in fifty year flood (e.g., about 438 cubic metres (15,500 cubic feet) per second for the Limestone River).

Requirements by the General Civil Contractor to construct various stream crossings were recently reviewed with DNR Fisheries Branch, and the Contractor will construct a culvert crossing in conformance with the provincial guidelines (Personal Communication, Dr. J. O'Connor) and the specific requirements of the local DNR representative (cf. Amendments to Work Permit #2420, issued October 2, 1985).

**Re: Aggregate Washing:**

- in addition to measures specified in Manitoba Hydro Tender Specification No. 1800 (item 24), the source of water for aggregate washing should be able to meet the hydraulic sorter's requirements without adversely affecting other users or the aquatic biota. Fingerlings should be protected from the water intake. The effluent should not be discharged directly back to the source if the increased suspended and dissolved solids may impact the aquatic biota. Precautions must be taken to limit erosion caused by the effluent discharge.
- the Limestone River should not be used as a water source for the hydraulic sorter, as per Tender Specification No. 1800 (item 24). In response, the Contractor is using the Nelson River as a source. The Contractor is required to discharge the effluent according to conditions of a DNR Work Permit (# 2419). The amount of suspended and dissolved solids in the effluent may be an insignificant contribution to the Nelson River.

**Re: Waste Rock Disposal:**

- Discussion Paper #2 recommended that rock disposal, currently proposed for areas north and south of the tailrace channel near the mouth of the Limestone River, leave an unobstructed 50 metre wide channel into the Limestone River. The materials

> disposed of should not be erodable or adequate surface rip-rapping should be used. Because excessive suspended sediments contributed by disposal activities may adversely affect fish populations, by disruption of water chemistry gradients which influence "homing" behaviour, and because such homing behaviour into creeks is thought to occur at night, all disposal activities should occur during daylight hours.

Subsequent refinement in Phase 2 liaison resulted in the recommendation in Discussion Paper #3 that constrained disposal in the Nelson River should occur only during the annual brook trout spawning run (timing as advised by DNR Fisheries Branch). The Environmental Inspector, working closely with the DNR NRO should exert maximum effort at this time in his assistance of the Contractor, to minimize disturbance of the spawning run.

It was recommended in Discussion Paper #3 that construction of the Stage Ia cofferdam should emphasize dumping as far away from the mouth of the Limestone River along the advancing face of the cofferdam as possible during the spawning run. Construction of the Stage Ia cofferdam has been completed. Manitoba Hydro's monthly reports to the Chairman of TAC are expected to describe attention to this recommendation.

Blasting activities of any kind must be scheduled to avoid occurrence during darkness hours when the spawning run is thought to occur (Gaboury 1978).

After issuance of Discussion Paper #2, it was determined that the location of the proposed Bird I pit is relatively close to an important brook trout spawning area on the Limestone River ("5-Mile Hole").

While the granular materials identified for Bird I are of very high quality re: concrete production and may be locally unique, the creation of access roads into the area will facilitate access to a spawning bed which historically has received strong netting pressure from Bird residents (Gaboury 1978). DNR and the study team believe that improved access would enhance netting and angling pressures which are already very high at this location. In addition, DNR is concerned that excavation anywhere near 5-Mile Hole could affect groundwater flow to this very important spawning habitat, possibly reducing spawning success.

The recommendation in Discussion Paper #3 that environmental inspection activities be provided for has been endorsed by DNR Fisheries Branch and DFO personnel as extremely important. The Environmental Inspector should be part of Manitoba Hydro's project management group, beginning in the last half of 1985 (cf. Section 4.4.4). To the extent possible, development of Bird I for aggregate should be monitored very carefully by the Environmental Inspector because of its proximity to 5-Mile Hole. DNR should work closely with the contractor and Manitoba Hydro (through the recommended Environmental Inspector) during borrow pit development to minimize further access to and impacts on the 5-Mile Hole area. Ongoing enforcement and inspection actions in the area by the proposed Resources Enforcement Officer and Environmental Inspector are highly recommended, especially re: any actions having potential to disturb groundwater flow and quality.

Because Bird III granular materials are in proximity to the 3-Mile Hole spawning area, development of this pit must also be carefully monitored (e.g., by Environmental Inspector) to ensure minimal environmental impact.

The Manitoba Hydro Tender Specification No. 1800 requirement (item 29) for submission of a borrow pit development plan by the successful contractor provides a mechanism to assist the contractor to minimize adverse environmental effects. To date, early identification by DNR Fisheries Branch of protective criteria regulating access road location has been beneficial to the contractor in the development of this plan. Such dialogue should continue.

Provincial requirements that the contractor obtain various permits (e.g., under the Fire Protection and Crown Lands Acts, the Mines Act) have assisted the General Civil Contractor in planning borrow pit developments with minimum environmental damage. DNR issuance of permits has been and will continue to be guided by input from interested agencies (e.g., Fisheries Branch), by specification of caveats to the permits (viz. access road location, development, decommissioning, etc.). On-site liaison with DNR field staff has expedited development of the pit access roads in environmentally sensitive areas.

## 4.9 EFFECTS OF FLOODING AND EROSION

Previous studies (Penner, et.al. 1975, Lower Nelson Overview Study Team 1981) concluded that Limestone project flooding and subsequent shoreline erosion would not constitute major issues because:

- flooded area within the forebay was expected to comprise less than 300 hectares;
- flooding was expected to be restricted to the Nelson River Valley and was not expected to extend beyond 60 metres laterally from present shorelines, except in portions of two tributary streams (Clements and Brooks Creeks);
- areas to be flooded are uninhabited, contain no man-made structures and are relatively inaccessible due to the steep grade;
- no merchantible timber was predicted to be impacted;
- maximum shoreline recession initiated by flooding was expected to be about 20 metres;
- the relatively minor flooding and erosion was predicted to have little long term negative impact on water quality.

Water Resources Branch confirmed their earlier belief that anticipated flooding and erosion associated with the Limestone project would likely be minor and therefore of little concern, and that water quality would not undergo any significant long term negative changes. Accordingly, in Discussion Paper #2, flooding and erosion were regarded as issues not expected to require significant impact management efforts. However, data acquired in Phase 3 analysis and concerns raised by the Geological Services Branch of Manitoba Department of Energy and Mines in the Phase 2 liaison process have suggested that localized erosion may be significant and may require impact management viz. clearing policy and procedures.

In Phase 3 analysis, discrepancies were identified between predicted Long Spruce flooded area maps (Penner et.al. 1975) and the observed post-impoundment Long Spruce forebay configuration in recent aerial photographs. The discrepancies consist of unpredicted, localized erosion that has occurred in certain sections of shoreline.

In general, creek mouths and drainage valleys (active and inactive) within the Long Spruce forebay were found to be sites of pronounced local erosion. In Phase 3 liaison, Geological Services Branch advised that the potential for Limestone forebay shoreline erosion warranted further consideration due to stratigraphic complexities within the unconsolidated, discontinuously permafrosted overburden, which differs from that within the Long Spruce forebay. The abundant fine-grained strata are of unknown chemical and structural composition, and are likely prone to slumping.

The Long Spruce flooded area estimates were deduced after the forebay static inundated level (SIL) contour was drawn on topographic maps. The original Limestone flooded area estimate of approximately 260 hectares was produced in a similar fashion and does not account for any erosion, despite observations in the Long Spruce forebay that flooding will initiate erosion of shorelines and thus increase flooded area.

Discussion Paper #3 recommended that erosion-susceptible Limestone forebay shorelines (e.g., creek mouths) should be carefully assessed for erosion potential. Erosion-susceptible areas were to be identified so that formulation of localized clearing policies which emphasize bank maintenances as highest priority can be developed in a timely fashion. In addition, soil from erosion-susceptible areas was to be sampled and analyzed in order that the resulting water quality impacts can be predicted more accurately.

Discussion Paper #3 also recommended that if feasible, low level digital remote sensing techniques should be utilized to evaluate bank stability viz. spectral (thermal) "signature" of wet/permafrost areas, on exposed bank slopes, etc.

As a result of these recommendations, Manitoba Hydro initiated field studies in the Limestone forebay, in areas predicted to experience bank slumping and erosion on the basis of airphoto interpretation and studies of the Long Spruce forebay. In August 1985, the recommended field studies were conducted, and a preliminary clearing policy and designated special clearing areas are being prepared for the utility's consideration. Clearing will likely be conducted in erosion-prone areas so as to ensure the presence of standing stumps, which will reduce the effect of wind-induced waves on flooded, cleared shorelines, thereby promoting bank stability (Acres 1981).

In Chapter 5, Socio-Economic Issues, impacts and impact management programs are discussed.

## CHAPTER 4 FOOTNOTES

[1] Anadromy is a fish behaviour wherein individuals typically spend a portion of their adult life in the saline marine environment before migrating upstream, typically into freshwater natal streams (where they were hatched) to spawn. Anadromous behaviour is thought to enhance growth and fecundity, enhancing the prospects of survival of such individuals, and ultimately, of the species.

[2] Salmonid fishes are species of the Salmon family (Salmonidae), which includes salmon, trout, charrs and whitefish.

## SELECTED REFERENCES - CHAPTER 4

Acres Consulting Services Ltd., 1981. Reservoir Clearing and Preparation - Environmental Protection Strategies. Unpublished Report Prepared for Ontario Hydro. 111 pages.

Aggus, L.R. "Summer benthos in newly flooded areas of Beaver Reservoir during the 2nd and 3rd years of filling 1965-1966." Reservoir Fisheries Limnology Special Publication No. 8. Washington, 1971. pp. 139-152.

Ayles, H.A., S. Brown, K. Mahiniak and J. Sigurdson. "The Fisheries of the Lower Churchill Lakes, the Rat-Burntwood Lakes and the Upper Nelson Lakes: Present Conditions and the Implications of Hydro-Electric Development." Technical Report Appendix 5, Fisheries and Limnology. Volume 2. The Lake Winnipeg, Churchill and Nelson Rivers Study Board. 1974.

Anonymous. Stream Enhancement Guide. DRO and B.C. Ministry of Environment. Vancouver, 1980.

Anonymous. 1980 Survey of Sportfishing in Manitoba. Manitoba Dept. of Natural Resources (Winnipeg), and Canada Dept. of Fisheries and Oceans (Ottawa). 1984. 60 pages.

Beanlands, G.E., and P.N. Duinker. An Ecological Framework for Environmental Impact Assessment in Canada. Institute for Resource and Environmental Studies, Dalhousie University. 1983. 132 pages.

Bodaly, R.A., T.W.D. Johnson, R.J.P. Fudge and J.W. Clayton. "Collapse of the lake whitefish (Corregonus clupeaformis) fishery in Southern Indian Lake, Manitoba, following lake impoundment and river diversion." Can. Journal Fish. Aquat. Sci. 41. 1984. pp. 692-700.

Bodaly, R.A. and L.F.W. Lesack. "Response of a boreal northern pike (Esox licius) population to lake impoundment: Wupaw Bay, Southern Indian Lake, Manitoba." Can. Journal Fish. Aquat. Sci. 41. 1984. pp. 706-714.

Chamberlin, T.W. Aquatic System Inventory (Biophysical Stream Surveys). B.C. Ministry of Environment, Aquatic Studies Branch. Victoria, 1980. 99 pages.

__________. "Systematic Aquatic Biophysical Inventory in British Columbia, Canada." Proc. Symp. Acquisition and Utilization of Aquatic Habitat Inventory Information. American Fisheries Society. 1981. pp. 17-25.

Crippen Acres Ltd. Limestone Generating Station. Affects (sic) of Construction and Operation of the Development on the Spawning Habits of the Sea-Run Brook Trout up the Limestone River. Unpublished report to Manitoba Hydro. Winnipeg, 1985. 19 pages.

deLeeuw, A.D. "A British Columbia Stream Habitat and Fish Population Inventory System." *Proc. Symp. Acquisition and Utilization of Aquatic Habitat Inventory Information.* American Fisheries Society. 1981. pp. 32-40.

Diduik, A.B. *Fish and Wildlife Resources Impact Assessment - Lower Nelson River.* Man. Dept. Mines, Resources, Environment Manag. Winnipeg, 1975. 216 pages.

Doan, K.H. "Speckled trout in the Lower Nelson River region, Manitoba." *Fish Res. Bd. Can. Bull. 79.* 1948.

Doan, K.H., A. J. Derksen, J.F. O'Connor and G.R. Thomas. *Brook trout and hydro electric power development in the Lower Nelson River, Manitoba.* Man. Mines, Res. and Environ. Mgt. MS Rept. 1975.

Gaboury, M. *Biological Investigation on Brook Trout (Salvelinus fontinalis) Populations in the Long Spruce-Limestone Area from 1975 to 1977 and Implications of Hydro-Electric Development of the Lower Nelson River, Manitoba.* Fisheries Research Section MS Report No. 78-49. 1978. 146 pages.

Gaboury, M. *A Report on the 1979 Study of Brook Trout (Salvelinus fontinalis) Populations in the Lower Nelson River System*. Manitoba Fisheries Branch MS Report No.80-23. 1980.

Gaboury, M. N. and J. W. Patalas. *The Fisheries of Cross, Pipestone and Walker Lakes, and effects of hydro-electric development*. Man. Dept. Nat. Res. MS Report No.82-14. 1982. 198 pages.

Geen, G. H. "Effects of Hydroelectric Development in Western Canada on Aquatic Ecosystems." *J. Fish. Res. Bd.* Can. 31. 1974. pp.913-927.

Green, D. J. and A. J. Derksen. *The Past, Present and Projected Demands on Manitoba's Freshwater Fish Resources*. Man. Dept. Nat. Res. MS Report No.84-4. Winnipeg, 1984. 171 pages.

Harkness, W.J.K. and J.R. Dymond. *The Lake Sturgeon - The History of Its Fishery and Problems of Conservation*. Fish Wild. Branch, Ont. Dept. Lands Forests. 1961.

Hecky, R. E. and S. J. Guildford. "Primary productivity of Southern Indian Lake before, during, and after impoundment and Churchill River diversion." *Can. J. Fish. Aquat.* Sci. 41. 1984. pp.591-604.

Hecky, R. E., R. W. Newbury, R. A. Bodaly, K. Patalas and D. M. Rosenberg. "Environmental Impact Prediction and Experience: The Southern Indian Lake Experience." *Can. J. Fish. Aquat.* Sci. 41. 1984. pp.720-732.

IEC Beak Limited. Assessment of Juvenile Atlantic Salmon Stocks in the South Branch Jacquet River. Unpublished Report to Brunswick Mining and Smelting Corp. 1984. 48 pages.

Issom, B. G. "Effects of Storage and Mainstream Reservoirs and Benthic Macroinvertebrates in the Tennessee Valley." Reservoir Fisheries Limnology. American Fisheries Society Special Publication No.8. Washington, 1971. pp.179-192.

June, F. C. "The Reproductive Biology of Northern Pike, Esoc lucius, in Lake Oake, an Upper Missouri River Storage Reservoir." Reservoir Fisheries and Limnology. American Fisheries Society Special Publication No.8. 1971.

Keeley Reporting Services Inc. Hearings Proc. Nat. Energy Bd., Order EH-6-84 (Manitoba Hydro-Electric Board). (7). 1984. pp.1,198-1,206.

Kooyman, B. Speckled Trout Investigation Northern Manitoba Nelson River Area, July, August, September, 1951. 1951.

Larche, R. A. Critical and Important Wildlife Areas in Northern Manitoba. Man. Dept. Mines, Res. and Env. Manag. Planning Branch MS Report. 1972. 21 pages.

Li, S. and G. B. Ayles. "An Investigation of Feeding Habits of Walleye (Stizostedion vitreum vitreum) Fingerlings in Constructed Earthen Ponds in the Canadian Prairies." Can. Tech. Rep. Fish. Aq. Sci. No.1040. Dept. Fisheries and Oceans. Winnipeg, 1981. 10 pages plus iv.

Liaw, W. K. Pond Rearing of Walleye (Stizostedion vitreum vitreum) Fingerlings in Saskatchewan. Saskatchewan Fisheries Laboratory. Technical Report 84-1. Saskatoon, 1984. 80 pages.

Liaw, W. K. Pond Rearing of Whitefish (Coregonus clupeaformis) Fingerlings in Saskatchewan. Saskatchewan Fisheries Laboratory. Technical Report 84-2. Saskatoon, 1984. 42 pages.

Lower Nelson Overview Study Team. The Lower Nelson Overview Study. Report to Manitoba Hydro. 1981. 251 pages.

Machniak, K. The Effects of Hydroelectric Development on the Biology of Northern Fishes (Reproduction and Population Dynamics). I. Lake Whitefish (Coregonus clupeaformis Mitchell). A Literature Review and Bibliography. Environment Canada Fisheries and Marine Service Tech. Report. The Lower Nelson Overview Study. Report to Manitoba Hydro. 1975.

Machniak, K. The Effects of Hydroelectric Development on the Biology of Northern Fishes (Reproduction and Population Dynamics). IV. Lake Trout (Salvelinus namaycush Walbaum). A Literature Review and Bibliography. Environment Canada Fisheries and Marine Service Tech. Rep. No.530. Winnipeg, 1975. 52 pages.

MacLaren Plansearch Inc. Ecological Monitoring Program: NFA Arbitration Claim #18. Report to the Claim 18 Four-Party Advisory Committee. Winnipeg, 1983. 66 pages.

MacLaren Plansearch Inc. (in association with Quaternary Consultants Ltd.) Mitigation of Limestone Project Impacts on Heritage Resources. Phase I Report - Results of Initial Reconnaissance and Phase II Action Plan. Unpublished report to Manitoba Hydro. 1985. 29 pages.

Manitoba Hydro. Tender Specification No. 1800. Limestone Generating Station. 1984.

Papst, M. H. and G. E. Hopky. "Growth of Rainbow Trout (Salmo Gairdneri Richardson) in a Pilot Commercial Rearing System." Can-Tech. Rep. Fish. Aq. Sci. No.1112. Dept. Fisheries and Oceans. Winnipeg, 1982. 18 pages plus iv.

Papst, M. H. and G. E. Hopky. "Growth of Arctic Charr (Salvelinus alpinus L.) in a Pilot Commercial Rearing System." Can-Tech. Rep. Fish. Aq. Sci. No.1118. Dept. Fisheries and Oceans. Winnipeg, 1983. 16 pages plus iv.

Patalas K. and A. Salki. "Effects of impoundment and diversion on the crustaccean plankton of Southern Indian Lake." Can. J. Fish. Aquat. Sci. 41. 1984. pp. 613-637.

Penner, D.Sie, H. Henderson and P. Ould. Lower Nelson River Study, River Geomorphology and Timber-Clearing. Man. Dept. Mines, Res. and Environ. Mgt. Water Res. Br., Plan. Div., Geotech. Sect. 1975. 276 pages.

Raleigh, R. F. Habitat Suitability Index Models: Brook Trout. In U.S. Department of the Interior, Fish and Wildlife Service Publication No. FWS/OBS-82/10.24. 1982. 43 pages.

Riddle, D. K. Archaeological Appraisal of the Lower Nelson River, Northern Manitoba. Arch. Res. Centre, Resource Appraisal Report No. 1. 1975. 12 pages.

Schwalme, K. and W. C. MacKay. Preliminary biological evaluation of the Lesser Slave River Fishway. Unpublished report to Alberta Environment Planning Division by Department of Zoology, University of Alberta. Edmonton, 1985. 89 pages.

Sunde, L. A. Growth and Reproduction of the Lake Sturgeon (Acipenser fulvescens Rafinesque) of the Nelson River in Manitoba. M.Sc. Thesis, Univ. B.C. 1961.

Tabachek, J. L. "Evaluation of Glower Diets for Intensive Culture of Two Strains of Arctic Charr (Salvelinus alpinus L.)." Can. Tech. Rep. Fish. Aq. Sci. No. 1281. Dept. Fisheries and Oceans. Winnipeg, 1984. 21 pages plus iv.

Therien, N., K. Morrison, C. Hugereau and M. deBroissia. "A model of plankton dynamics in northern reservoirs." Simulating the Environmental Impact of a Large Hydroelectric Project. The Society for Computer Simulation, Vol. 9(2). LaJolla, California, 1981. pp. 55-70.

Weaver, C. R. Influence of water velocity upon orientation and performance of adult migrating salmonids. U.S. Fish Wildl. Serv. Fish. Bull. 63. 1963. pp. 97-121.

Wiens, A. P. and D. M. Rosenberg. "Effect of impoundment and river diversion on profundal macrobenthos of Southern Indian Lake, Manitoba." Can. J. Fish. Aquat. Sci. 41. 1984. pp. 638-648.

# Chapter 5

# CHAPTER 5

# SOCIO-ECONOMIC ISSUES AND IMPACT MANAGEMENT STRATEGIES

## 5.1 SCOPE

The socio-economic portion of the study examined issues and strategies related to the Limestone project that were of relevance to residents of communities in the Limestone Study Area. The emphasis was on issues and concerns potentially affecting local people and institutions that would be in the study area regardless of the Limestone project. Addressing the needs of project workers who would come into the area as a result of the project was outside the scope of the study. Other forums, including the project collective bargaining process, the activities of the Northern MLA's Committee and the Industrial Benefits Committees, were considered more appropriate for dealing with these matters. For these reasons, the socio-economic portion of the study focused heavily on the permanent communities of Gillam and Bird and gave very limited consideration to Sundance and the construction camp, which were temporary facilities established specifically to serve the needs of Limestone construction workers.

## 5.2 ISSUES REQUIRING IMPACT MANAGEMENT - OVERVIEW OF PROCESS AND RESULTS

Through a combination of literature review, the consultant's experience in assessing major project impacts, key person interviews with local residents and the liaison process, a total of 19 categories of socio-economic issues were identified as potentially relevant to the local area. During Phase 2, each of these issues was examined to determine which would require impact management and monitoring. For this purpose, information was analyzed about project description, proposed employment, business and worker policies and programs, local conditions and characteristics, and the experience of other and earlier projects, in particular, hydro-electric development of Long Spruce. Especially useful were the data and insights obtained from forty key person interviews conducted with present and former residents of Gillam and Bird. These interviews with local politicians, local administrators of publicly provided services, resource harvesters, local business people, long time residents of Gillam and Bird, members of the Fox Lake Band and local Manitoba Hydro personnel, were most useful in three respects:

1. obtaining or verifying key information about the socio-economic and environmental characteristics of the local area;
2. providing first-hand insights into the experience of local residents with the Long Spruce and Kettle projects; and
3. identifying impact management needs and strategies.

In the process of identifying impact management needs, it became apparent that there were no major or serious anticipated socio-economic impacts or concerns stemming from the Limestone project with respect to local residents. In many areas little or no problems were expected while, in the remainder, anticipated problems and concerns were of a moderate or minor nature. This is somewhat surprising for a project as large as Limestone occurring in as remote and sparsely populated a region as the study area. Typically, this situation generates a number of major socio-economic impacts and a full array of socio-economic impact management needs. Several factors account for a more benign situation being expected with Limestone:

1. There are a number of measures being undertaken by Manitoba Hydro and the Manitoba Government that can be expected to significantly reduce potential problems. From a local socio-economic perspective, the following are particularly relevant:

    a. a self-contained construction camp has been established to house all single construction workers. The camp contains a wide range of facilities and services including a recreational centre and a beverage room.

Workers living in camp receive free board and room. This will deter single status workers from living in local communities and will tend to moderate the extent of their visits to these communities;

b. a temporary community has been established at Sundance to house construction workers who want to establish homes and bring their families with them. This will greatly reduce the number of workers and families that move into local communities during project construction. For the Long Spruce project there was no community similar to Sundance; as a result workers with families lived in Gillam, leading to an increase in the community's population of about 1,500 people and concomitant pressures on community infrastructure and services. The presence of Sundance is likely to moderate the population increase in Gillam to a level of less than 300 people at the time of peak construction activity;

c. Manitoba Hydro, the Manitoba Government and the construction trade unions are undertaking extensive policies and programs to maximize participation of northern residents in employment and business opportunities of the Limestone project. These measures, which are considerably more elaborate than for the Long Spruce project, include extensive pre-employment training programs, hiring preference for northerners on project jobs, priority treatment for northerners of native ancestry, and northern business support; since they are part of northern Manitoba, residents of Gillam and Bird are eligible for these special measures.

2. The community of Gillam can accommodate greater increases in population and social change associated with the project than most other communities in a similar situation owing to the following unique circumstances:

   a. two other hydro-electric projects, i.e., Long Spruce and Kettle, were developed previously in the region. Gillam was the centre of socio-economic impacts associated with these projects. Because of this experience, residents are in a better position to anticipate and respond to possible impacts;

   b. the community's current population of about 1,100 is well below half of its highest level during the 1970s. Consequently, the community has considerable surplus infrastructure capacity, particularly with

Workers living in camp receive free board and room. This will deter single status workers from living in local communities and will tend to moderate the extent of their visits to these communities;

b. a temporary community has been established at Sundance to house construction workers who want to establish homes and bring their families with them. This will greatly reduce the number of workers and families that move into local communities during project construction. For the Long Spruce project there was no community similar to Sundance; as a result workers with families lived in Gillam, leading to an increase in the community's population of about 1,500 people and concomitant pressures on community infrastructure and services. The presence of Sundance is likely to moderate the population increase in Gillam to a level of less than 300 people at the time of peak construction activity in 1987;

c. Manitoba Hydro, the Manitoba Government and the construction trades are undertaking extensive policies and programs to maximize participation of northern residents in employment and business opportunities of the Limestone project. These measures, which are considerably more elaborate than for the Long Spruce project, include extensive pre-employment training programs, hiring preference for northerners on project jobs, priority treatment for northerners of native ancestry, and northern business support; since they are part of northern Manitoba, residents of Gillam and Bird are eligible for these special measures.

2. The community of Gillam can accommodate greater increases in population and social change associated with the project than most other communities in a similar situation owing to the following unique circumstances:

   a. two other hydro-electric projects, i.e., Long Spruce and Kettle Rapids, were developed previously in the region. Gillam was the centre of socio-economic impacts associated with these projects. Because of this experience, residents are in a better position to anticipate and respond to possible impacts;

   b. the community's current population of about 1,100 is well below half of its highest level during the 1970s. Consequently, the community has considerable surplus infrastructure capacity, particularly with respect to serviced trailer lots, water and sewer systems, school facilities, medical facilities and recreational facilities.

3. The area flooded by the project is very small and will not affect any homes or community facilities in the local area. Consequently, the very disruptive effects of forced relocation will not occur with this project.

In light of these circumstances, the study team found that only 7 of the categories of socio-economic issues were expected to require impact management, while the remaining 12 categories either did not require or were not considered amenable to impact management. The subsequent liaison process confirmed this finding, with one exception. The Technical Advisory Committee felt that Historic Heritage Resources, which had been identified as not requiring impact management, should be subject to the same mitigation measures that were being proposed for Prehistoric Heritage Resources. Since similar measures would be used in both cases, the issue of Historic Heritage Resources was combined with Prehistoric Heritage Resources for the purpose of developing an impact management strategy and program. The resulting list of issues requiring and not requiring or being amenable to impact management is shown in Table 5-1.

## 5.3 STRATEGIES FOR IMPACT MANAGEMENT -- OVERVIEW OF PROCESS AND RESULTS

A series of impact management strategies was identified and assessed for each issue requiring impact management. Strategies for Historic Heritage Resources were addressed under the topic of Heritage Resources which is presented in the previous chapter on Environmental Issues.

Through information from key person interviews, discussions with officials in relevant provincial and federal government agencies, and the consultant's knowledge of approaches used on other major projects, the study team identified 23 strategies that merited assess-

## TABLE 5-1

## SOCIO-ECONOMIC ISSUES REQUIRING AND NOT REQUIRING IMPACT MANAGEMENT

### Issues Requiring Impact Management

(1) Population - Speculative In-migration
(2) Community Awareness
(3) Worker Interaction
(4) Socio-Economic Monitoring
(5) Local Economy - Employment
(6) Local Economy - Business
(7) Traffic
* (8) Historic Heritage Resources

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

### Issues Not Requiring or Amenable to Impact Management

(1) Population - Worker In-migration
(2) Local Government
(3) Locally Provided Public Services
(4) Transportation Services
(5) Communication Services
(6) Schools
(7) Health Care
(8) Lifestyle and Community Cohesion
(9) Reserve Land and Treaty Land Entitlement
(10) Housing
(11) Recreation and Leisure

* combined with Prehistoric Heritages Resources under Environmental Issues for purposes of developing impact management strategies.

ment with regard to the remaining 7 socio-economic issues. Three more strategies were identified during the Phase 2 liaison program by the Fox Lake Band and the Department of Indian Affairs and Northern Development.

During Phase 3, each of these strategies was assessed in terms of redundancy, acceptability and practicality to identify those that were necessary and likely feasible. This was accomplished through discussions with representatives of local organizations, provincial and federal agencies and Manitoba Hydro who might have a role in implementing the strategy or who had relevant knowledge to contribute to the assessment. As well, the experience of other projects with similar measures was examined, in particular, the Long Spruce project, the recent Norman Wells pipeline and oilfield development in the Northwest Territories, the Syncrude oilsands project in northeastern Alberta, the Aleyeska pipeline in Alaska, and the Revelstoke hydro-electric generation project in British Columbia.

As a result of this assessment, 17 of the strategies were determined to be necessary and likely feasible, 6 were found to be redundant and 3 were determined to be unacceptable or impractical. The strategies in each of these groups are summarized in Table 5-2 according to the category of issue that they intended to address. These findings were confirmed by the Phase 3 liaison process. There was little concern and general satisfaction with the socio-economic strategies being proposed for implementation. During Phase 3 and Phase 4, strategies determined to be necessary and desirable were developed in greater depth to clarify their objectives, timing, key design parameters, responsible parties, and costs. This occurred, as part of the process of assessing their feasibility, through follow-up discussions with relevant officials during Phase 4 and through the Phase 3 liaison process. Additional costs could be incurred for contingency measures such as mass media advertising and transportation allowance for speculative in-migrants.

TABLE 5-2

FINDINGS AND CONCLUSIONS ABOUT SOCIO-ECONOMIC STRATEGIES

| Issue | Strategies that are Redundant | Strategies that are Unacceptable or Impractical | Strategies that are Needed and Likely Feasible |
|---|---|---|---|
| Speculative In-migration | | | -informing potential job seekers<br>-contingency plan<br>-enforce "no squatting" and wayside park rules (part of contingency plan) |
| Community Awareness | | | -local information program |
| Worker Interaction | -special RCMP patrols through Bird<br>*band constable for Bird<br>*special counselling centre at Bird | | -community orientation workshop<br>-worker orientation program<br>-supervisory orientation program<br>-selective Band Council Resolution<br>-inform workers of special lay-off provisions<br>-co-operation between Manitoba Hydro and RCMP |
| Socio-Economic Monitoring | | | -monitoring speculative in-migration<br>-monitoring worker interaction<br>-household survey |
| Local Economy - Employment | -employment liaison officer for Fox Lake Band<br>-training and employment information for study area<br>-training preference to experienced candidates | -training and employment priority for study area residents on project jobs | *hire local residents for impact management jobs |
| Local Economy - Business | | -control transient traders | -special attention to initiatives of the Fox Lake Band<br>-information to Gillam business community |
| Traffic | -consult with Fox Lake Band on Bird VII access road | | -use of Bird I borrow site |

*indicates strategies arising from Phase 2 and Phase 3 discussions; other strategies were identified in Discussion Paper No.2

In conjunction with clarifying the strategies, key activities that should occur in 1985 and subsequent years were identified. These are presented according to impact management issue in Table 5-3. As the study proceeded through Phases 3 and 4, many of these items have been initiated by Manitoba Hydro and other groups.

The remainder of this chapter is organized around the categories of socio-economic issues requiring impact management, i.e., speculative in-migration, community awareness, worker interaction, socio-economic monitoring, local economy - employment, local economy - business, traffic. As noted above, one of the categories, Historic Heritage Resources, is addressed in the previous chapter. For each category: (1) issues and impact management needs are described; (2) strategies considered are presented and assessed; and (3) strategies found to be necessary and likely feasible are described to the extent practical; their current implementation status is noted. Categories of issues not requiring or amenable to impact management are presented in Appendix B, which outlines the nature of the anticipated issue and the reason(s) why impact management is not warranted.

## 5.4 POPULATION - SPECULATIVE IN-MIGRATION

### 5.4.1 Issues and Impact Management Needs

- Possibly the most important local socio-economic issue anticipated with regard to construction of the project is the arrival of unemployed workers to the study area on speculation that they will be able to obtain work.
- A source of temporary population change, this group may pose special problems in terms of temporary accommodation requirements and possible social services requirements.

TABLE 5-3

SOCIO-ECONOMIC IMPACT MANAGEMENT REQUIREMENTS IN 1985 AND SUBSEQUENT YEARS

| Mitigation/Monitoring Requirements - 1985 | Mitigation/Monitoring Requirements - Subsequent Years |
|---|---|
| SPECULATIVE IN-MIGRATION<br>-if a substantial number of in-migrants appear in 1985, undertake mass media advertising<br>-before the end of summer, conduct one to two day workshop in Gillam to develop contingency plans for use by locally based government services<br>-put in place monitoring network, using "front line" government services<br>-establish wayside park rules<br>-enforce "no squatting" regulations | SPECULATIVE IN-MIGRATION<br>-if a substantial number of in-migrants appear in any year, undertake mass media advertising<br>-ongoing monitoring<br>-use contingency plan, if required<br>-enforce "no squatting" regulations |
| COMMUNITY AWARENESS<br>-send out first two newsletters and hold first open house | COMMUNITY AWARENESS<br>-continue Limestone related information program throughout the construction period |
| WORKER INTERACTION<br>-hold initial workshop session in Bird to orient residents to the worker interaction issue; at the same time, establish monitoring mechanism to deal with problems<br>-develop worker orientation program to be ready for the start of construction<br>-incorporate environmental and socio-economic components into orientation program for supervisors<br>-consider rules and regulations for Bird which would selectively limit access to the community<br>-prior to travelling to site, inform workers of special lay-off provision<br>-co-operation between Manitoba Hydro and RCMP with regard to regulation of workforce | WORKER INTERACTION<br>-continue monitoring and periodically report to various local agencies<br>-hold community orientation update before peak of construction, if required<br>-continue worker orientation program<br>-continue supervisory orientation program<br>-consider rules and regulations for Bird which would selectively limit access to the community<br>-continue notification of workers of special lay-off provision<br>-co-operation between Manitoba Hydro and RCMP with regard to regulation of workforce |
| SOCIO-ECONOMIC MONITORING - HOUSEHOLD SURVEY<br>-undertake first annual household survey | SOCIO-ECONOMIC MONITORING - HOUSEHOLD SURVEY<br>-undertake annual household survey |
| LOCAL ECONOMY - EMPLOYMENT<br>-propose hiring local residents for impact management jobs | LOCAL ECONOMY - EMPLOYMENT<br>-propose hiring local residents for impact management jobs |
| LOCAL ECONOMY - BUSINESS<br>-give special attention to business initiatives of the Fox Lake Band<br>-meet with the Gillam business community to provide pertinent information and obtain feedback on business plans for Sundance<br>-ensure that procurement brochures and other relevant information are sent to each Gillam business<br>-consider the impact of the types of businesses chosen for Sundance upon the Gillam business community | LOCAL ECONOMY - BUSINESS<br>-give special attention to business initiatives of the Fox Lake Band<br>-ensure that procurement brochures and other pertinent materials are sent to each Gillam business |
| TRAFFIC<br>-select Bird I borrow site | |

- It is not possible to predict even an order of magnitude of the number of such people. Long Spruce experience suggests that the number of transients was quite small. However, several characteristics of the Limestone project have increased the likelihood of a sizable number of transients:
    1. The local area is now accessible by road; during Long Spruce the area was accessible only by rail and air. Both options were expensive and once people reached the area they were restricted without a car or place to stay. During Limestone construction, transients can bring cars to the local area, camp in them if necessary, and travel throughout the area.
    2. Unemployment levels everywhere, especially in the construction industry, are expected to be much higher than they were during the Long Spruce project, so more people will be looking for employment opportunities. At the time of its construction, Limestone will be one of the few large construction projects in Canada, giving it a higher profile during construction than earlier northern Hydro projects.
    3. Unemployment in the north is higher than during the Long Spruce project, creating the same speculative incentive for northerners as for others in Canada.
- Accommodation is the greatest need for these in-migrants. Because facilities in Bird and Sundance will be limited, it is likely that these people will:
    1. look for temporary accommodation in Gillam (only a 40-unit hotel is available with plans to expand by 16 units if the project goes ahead);
    2. attempt to stay at the proposed wayside park (due to be constructed in 1985) just outside Gillam, possibly competing for these sites with tourists in the area;
    3. attempt to camp illegally on public land, possibly near Bird, Sundance or the site.
- Require social service assistance if unable to find a job and their resources are exhausted.

NOTE: Another potential population issue was examined in the study and not found to be of concern, i.e., influx of construction workers, their families and spin-off workers and their families. This issue is addressed in Appendix B.

### 5.4.2 Impact Management Strategies

- Strategies for dealing with speculative in-migration must focus on:
  - preventing the in-migration;
  - dealing with the presence of, and problems caused by, in-migrants.

  Four strategies were identified during the study to address these.

#### Informing Potential Job Seekers

- To discourage speculative in-migration, potential job seekers should be informed that there is no advantage to being near the site for hiring opportunities.

  During the Phase 2 liaison meetings, the LGD of Gillam Council expressed concern that the mass media advertising campaign being carried out by the Manitoba Government to inform Manitobans about pending Limestone employment opportunities would spur speculative in-migration into the region. In response to this concern and technical discussion during Phase 3, the Manitoba Energy Authority in early April instructed the staff of its Limestone information offices in Winnipeg and Thompson to tell people who inquired about Limestone job opportunities that they should not go to Gillam. Also, since that time, information sent out to each caller states the following:

  "Please do not travel to the construction site to find work as hiring will be based upon referrals from CEIC offices."

  CEIC, Outreach and provincial government employment officers who are contacted about Limestone jobs have also been advised to say this. As well, for those people who contact a Canada Manpower Centre or Outreach office in the north or south, the procedures for being hired will be clearly outlined to them (e.g., no direct hiring at the site and dispatch through CEIC in the north or union hiring halls in the south).

- These measures will help to curb speculative in-migration; however, they will only reach people who respond to ads and check at CEIC or Outreach offices. Some people are likely to travel to the site for jobs on the basis of general information and without seeking more specific details. It is possible that this could still be a sizable group. Therefore, it is recommended that if a sizable number of speculative in-migrants travel to the Limestone study area at any time during project construction, that the Manitoba Energy Authority or the LGD of Gillam undertake a mass media advertising campaign (at least throughout Manitoba) that would discourage job seekers from journeying to the study area. Advertising of this type should be funded by the Government of Manitoba.

## Contingency Plan

- Contingency plans need to be established prior to construction by appropriate government services in order to respond to problems that could emerge from speculative in-migration. Experience at Tumbler Ridge, B.C. suggests that if problems occur, they are likely to emerge in the first years of the project. Therefore, it is important for relevant parties to establish the ground work for the plan prior to the first influx of new people. Discussions must be held between the parties who will ultimately have to deal with the problems of speculative in-migration to develop a plan that covers the following:

  - nature of the problem;
  - general approach to solution, i.e., policies;
  - specific mechanism for dealing with the problem;
  - party responsible for the action (i.e., which government department has jurisdiction?);
  - party responsible for funding if costs are incurred.

  These discussions should involve at least the following: Administration of LGD of Gillam, Fox Lake Band, Conservation officer in Gillam, RCMP in Gillam and Sundance, Outreach officer in Gillam, Limestone project staff from Manitoba Hydro, Manitoba Community Health and Social Services staff in Gillam, a representative of Manitoba Employment and Economic Security Services in Thompson and a representative of the Manitoba Energy Authority's Limestone information program.

- The contingency plans should recognize that there are likely to be different types of speculative in-migrants who will travel to the study area with various levels of personal resources and preparedness for the basic necessities: temporary shelter and food. As a result, the demands placed on local government services (e.g., emergency financial aid) and the types of problems created, if any, will also vary. For example, those with ample resources and arrangements for local housing are likely to cause no problems while those without resources are likely to need government assistance.

  Following are some of the types of in-migrants who may move to the local area:

  - former northern residents returning to establish six-month residency immediately prior to the project; they may have a mobile home in Gillam already, bring one to the area, or stay with relatives or friends;

- southern residents with mobile homes; some inquiries have been made in Gillam already about accommodating mobile homes temporarily before the in-migrant has a job at site and therefore can move the unit to Sundance;
- southern and northern residents accommodated with friends or relatives in Gillam or Bird;
- southern and northern residents with travel trailers, campers, tents or cars;
- southern and northern residents without any accommodation and limited resources, i.e., true transients or drifters.

A framework that could be used to help organize the contingency planning discussions is presented in Table 5-4. The table outlines some of the problems which may require action by government services in the local area. Noted for each problem are potential responses and actors who could be involved. Generally, the problems fall into the categories of:

1. meeting the needs of in-migrants -- shelter, food, or transportation home;
2. overtaxing of wayside park;
3. squatting and environmental degradation.

- The approaches to solving these problems can be quite varied, depending upon the philosophy of the government services. One approach would be for Gillam to prepare for transients by making available temporary accommodation, food and other services. The other approach would be to make as few services available as possible with the exception of assistance for transportation out of the LGD. The latter approach is recommended by the study team for the following reasons:
    - this approach would discourage in-migration by making it more difficult, rather than easier, to settle in the area;
    - experience at Tumbler Ridge suggests that, if services are provided, they become, in effect, a self-fulfilling prophecy which encourages in-migration;
    - discouraging in-migration will also minimize disruption to local communities and the environment;
    - costs borne by government services, especially the LGD, should be kept to a minimum; the latter approach minimizes the danger of investment in services (especially temporary accommodation) which ultimately may never be needed.

It should be possible to undertake much of this planning in one or two structured meetings held in Gillam. In response to this suggestion in Discussion Paper #3, the LGD of Gillam has initiated the planning process. On August 15, 1985, a meeting of representatives of all government agencies providing services in the Limestone study area was held in Gillam. This meeting addressed all types of Limestone-related population influxes, including speculative in-migration. An important outcome of the meeting was the identification of the readiness and responsiveness of the various agencies in attendance to various types of Limestone-related population increases. While many agencies appeared to be suitably prepared and able to respond to additional demand caused by the Limestone project, some were not. Concerns were noted in regard to the responsibility for and processing of welfare payments, and with respect to additional staff requirements for a social worker and public health nurse in the Limestone study area, probably at Sundance. Follow-up meetings should be held before March 1986 to clarify the contingency plans of various agencies with respect to population influxes.

## Establish Wayside Park Rules

- As noted in Table 5-4, the planned wayside park could be overtaxed or be subject to uses for which it was not intended if speculative in-migration is significant. Therefore, we recommend that the LGD of Gillam, with the approval of mayor and Council, establish clear guidelines for its use. We would suggest as a minimum:
    - compulsory registration of users;
    - a limit to length of stay;
    - no doubling up of camping spots;
    - regular patrols of LGD staff to ensure appropriate use of facilities, e.g. garbage control, etc.

## Enforce No Squatting Provisions

- As noted in Table 5-4, squatting in the town of Gillam or on Crown land in the LGD should be discouraged in an effort to minimize the disruption to the community and the environment. This is consistent with the overall preventative approach to speculative in-migration recommended above. It is important that there be strict enforcement of squatting laws by the LGD of Gillam, the Department of Natural Resources and Manitoba Hydro in the study area. This is especially true in the early

TABLE 5-4

SPECULATIVE IN-MIGRATION - POTENTIAL PROBLEMS AND SOLUTIONS

| Potential Problem | Potential Solutions | Potential Actors |
|---|---|---|
| -exhaustion of financial resources for food and other necessities while in area even if accommodated with friends or relatives<br>-lack of accommodation and food resources | OPTIONS:<br>-depending upon transients' eligibility for provincial welfare, provide financial assistance; this would apply to non-native and non-status Indian and Metis people | -Manitoba Dept. of Employment Services and Economic Security (Thompson); would have to designate local contact -- possibly relocation counsellors scheduled to be stationed in the area and eventually own staff person if warranted |
|  | -in theory, reciprocal agreements between bands means that Fox Lake Band can provide financial assistance to status Indian people who in-migrate to the LGD; this does not always work in practice (e.g., some bands have not reimbursed Fox Lake Band in the past) | -Fox Lake Band; bands of in-migrants |
|  | -provide financial assistance to transients to leave LGD via bus, train or plan to home community or Winnipeg, possibly as alternative to financial aid to stay in area | -as above for non-native, non-status and Metis group and status Indian group respectively |
|  | -provide temporary accommodation and food resources; on an emergency basis, cots could be set up in that part of the Gillam recreation centre which is not used in summer | -LGD Gillam; emergency basis only |
|  | -establishing temporary hostel (e.g., trailer units) considered impractical |  |
| -competition with genuine tourists for use of planned wayside park | -establish registration and day limits for use of park; if necessary, institute fee structure conducive to relatively short stay (current plans are to charge no fee) | -LGD Gillam; would have to be approved by mayor and council |
| -overtaxing of facilities at wayside park (outdoor privies, barbecues, picnic tables; water will be available only from tap in Gillam) | -although twenty sites are planned for 1985, the overall plan can accommodate sixty sites; however, expansion beyond normal plans may not be appropriate as it might lengthen the stay of in-migrants | -LGD Gillam |
|  | -register park users and ensure that no doubling up in spaces occurs; overflow of those wishing to camp could be referred to designated overflow area with one or two days grace period before moving on | -LGD Gillam staff; guidelines would have to be approved by mayor and council |
| -environmental degradation of Crown land if uncontrolled squatting occurs, i.e., cutting trees for firewood, open fires, garbage and sewage disposal, use of water sources | -discourage squatting (e.g., camping in undesignated areas) via enforcement of Crown Lands Act, and other acts which allow for such control (e.g., Clean Environment Act); the limits of specific provisions would need to be examined in more detail | -Dept. of Natural Resources, along with LGD Gillam and, if required, RCMP |
| -transient squatting within the boundaries of the Town of Gillam | -by-laws regarding curfew for children, public order and mortality, licencing of non-permanent dwellings and zoning provisions should provide the authority to control such use; limits of specific provisions would need to be checked | -LGD Gillam and RCMP, if necessary |

years of construction so that people do not get the impression that squatting is permitted. Any such impression could precipitate further squatting.

- The process of addressing the enforcement of squatting regulations got under way in response to Discussion Paper #2 with a meeting in May of officials in the provincial Departments of Municipal Affairs and Natural Resources to review their respective roles and responsibilities and the opportunities and constraints presented by the legislation that they administer. This meeting and subsequent discussions initiated by the Chairman of TAC determined the following responsibilities for addressing squatting in the study area. The parties responsible were notified of their responsibilities.
  - The three main authorities are the Lands Branch in the case of Crown land, the LGD of Gillam in the case of private land, and Manitoba Hydro in the case of land within the water licence area. Lands Branch acquires its authority from the Crown Lands Act, the LGD primarily from the Planning Act, and Manitoba Hydro from its Licence under the Water Power Act.
  - If unauthorized use of land takes place within the Licence area, Manitoba Hydro may exercise any authority clearly delegated to it by the Licence. Where the exercise of authority is not clearly attributed to Manitoba Hydro by the Licence, Lands Branch will be the authority and may take action under the Crown Lands Act. (It is also conceivable that Water Resources Branch could take action under the Water Power Act. This would depend on individual circumstances.)
  - Lands Branch is also the responsible authority in the case of all other Crown land whether within or outside the LGD of Gillam.
  - The LGD Council is responsible in accordance with its Development Plan adopted under the Planning Act for all action regarding contraventions of the plan on private and Crown leased land within the LGD.
  - Police action in any of the above situations may be taken by the RCMP or Natural Resources officer, whichever is deemed most appropriate in the given case.

- Because the magnitude and duration of the speculative in-migrant problem cannot be estimated, we do not recommend that additional staff person-years be put in place immediately for the LGD of Gillam, Department of Natural Resources or RCMP to deal with this problem. However, government should be aware of the potential for taxing of existing staff resources and be ready to respond with assistance (e.g., relief help from other areas) if necessary.

## 5.5 COMMUNITY AWARENESS

### 5.5.1 Issues and Impact Management Needs

- It was evident in the field interview program conducted in Gillam, Bird and Sundance during January that pertinent information about the Limestone project was needed. In general, at that time, the community of Gillam showed a lack of appropriate information about the Limestone project, resulting in rumours about expected events and impacts. Although residents have experience from earlier projects to draw from, they did not have proper information about Limestone per se.

- Those in the business community, in particular, noted that they were loathe to make any business plans without basic information about population change, local business policies, plans for Sundance retail space, etc. Others in Gillam and Sundance, especially those providing public services (LGD Administration, hospital, school) could benefit by advance information about the project and its impacts.

### 5.5.2 Impact Management Strategy

#### Local Information Program

- It was suggested in Discussion Paper #2 that a Limestone-related information program be established for Gillam and Bird. In response to this suggestion, Manitoba Hydro has committed itself to undertaking such a program. Hydro intends to use a two-pronged approach to providing local information:

  1. a newsletter to be distributed to all households in Gillam, Bird and Sundance;
  2. open houses to be held in Gillam.

- The newsletter, to be called "Limestone Update", will be published at least two times per year throughout the Limestone construction period. Two to four pages in length, it will provide information on topics that are relevant to study area residents about the Limestone project including:

  - project schedule;
  - forthcoming project activities;
  - workforce levels;
  - how project workers will be accommodated and services available to workers;
  - how workers will arrive and leave the study area;

- northern employment and business opportunities policies;
- status of the EIS and monitoring studies;
- expected flooding and other environmental impacts of the project;
- expected population and other socio-economic impacts of the project;
- project-related issues that have emerged in the study area during construction.

The first newsletter was sent out at the end of May 1985. It contained articles about the following items:

1. newsletter's purpose;
2. status of the EIS including issues requiring impact management;
3. overview of the Limestone project and its construction schedule;
4. size of the Limestone workforce and how it will be accommodated;
5. invitation to the open house.

- Offering a more personalized approach to supplying information, Limestone open houses will be held annually until at least 1989. Community residents will be invited to talk on an individual basis with Hydro and government officials who are knowledgeable about the Limestone project. There will also be displays and printed handouts at each open house, which will last from one-half to two days. Communities will be informed about the open houses through the newsletter and posters. The first of these occurred in Gillam on June 20, 1985. In attendance were representatives of Manitoba Hydro's Limestone project and environmental services departments, the EIS study team, the Manitoba Energy Authority and IPB/MEARA. Transportation was provided for people in Bird and Sundance who wished to attend.

## 5.6 WORKER INTERACTION

### 5.6.1 Issues and Impact Management Needs

- A concern that would be expected from any construction project of the scale of Limestone is the social problems arising from the inevitable contact between the large number of workers from the construction camp and local residents in Bird, Sundance and Gillam. Review of this issue indicates that any significant concerns would be centered in Bird.
- A key source of insights on this issue were key person interviews with people who lived in the study area during the Long Spruce

project: non-native long term residents (pre-Kettle era); Fox Lake Band; long term residents (since the beginning of Kettle or Long Spruce); RCMP (including those resident during Long Spruce).

- **Bird**

1. Due to its close proximity to the camp, there is a good chance that project workers will want to visit Bird during their off-hours. Worker interaction with Bird residents could lead to problems, although opinions varied as to the existence and solutions to the anticipated problems. Some of the Fox Lake Band members interviewed were not concerned about nearby camp workers visiting the community, while other members were very concerned and wanted to see Bird closed to such visits. Some felt that workers would visit Bird uninvited while others felt that they would only enter the community by invitation. The nature and magnitude of the problems which may result are not clear at this time.
2. There will be an RCMP detachment at Sundance to police the project area. This will help to reduce potential problems in this area.

- **Gillam**

Less concern was expressed by Gillam residents to the study team than was anticipated. This was based on their experience with previous projects.

1. Public safety (personal or property) or even harassment was not a problem during Long Spruce construction and is not perceived to be an issue this time by twelve of thirteen long term residents (including pre-Kettle and post-Kettle residents). However, some members of Fox Lake Band were concerned about the kinds of people who would be visiting Gillam, indicating that, as parents, they would have to be more cautious with children who now play outdoors without fear.
2. Trouble did occur (e.g., assaults) during the last two projects but it was confined to the pub in the hotel, less frequently to dances or to homes. Trouble was always accompanied by alcohol consumption. One RCMP officer indicated that they were never called to a dance during his tour of duty (Long Spruce) but were frequently called to the pub or to a small number of homes involved in parties after the pub closed. Most of those interviewed did not express concern over this localized interaction from a public safety point of view; some did not perceive that even this type of interaction occurred as frequently as others perceived it to occur. Some of those interviewed

noted that there was an increased availability of drugs in the community due to the presence of construction workers.

3. Gillam is likely to experience some interaction with camp workers, but to a lesser extent than during Long Spruce and Kettle, because:
    a. the camp is further from Gillam;
    b. the new road may attract some workers to Thompson as an alternative to Gillam;
    c. the RCMP have indicated they will be fully prepared and fully staffed for Limestone to handle any disturbances whereas some short staffing occurred at the peak of Long Spruce.

For these reasons, it is unlikely that worker interaction will be a source of significant problems in Gillam.

- **Sundance**

  Worker interaction with Sundance is likely to be of no concern, according to key persons interviewed, because:

  - past experience with Stage 1 of the Limestone construction resulted in no problems;
  - married and single men work together on the site and this tends to mitigate potential personal disputes during off-hours.

- A worker interaction problem of an entirely different nature could emerge on the project itself. This would occur as an unintended consequence of the northern employment policy, especially as it relates to lay-offs. The convention in the construction industry is that lay-off procedures are at the discretion of the contractor. Under the Limestone collective agreements, when seasonal lay-offs occur native employees are generally laid off last. This could lead to adverse attitudes toward native workers.

### 5.6.2 Impact Management Strategies

Nine strategies were identified during the course of the study to address this issue. Six were found to be necessary and likely feasible and three were found to be redundant. Those found to be necessary and likely feasible are presented first.

### Co-operation Between Manitoba Hydro and RCMP

- Discussions with RCMP staff in Winnipeg and Gillam during the study indicated that the support of Manitoba Hydro for the RCMP in their enforcement duties in local communities will be important in controlling behaviour of camp residents when outside the camp. They felt that they had received this type of support during the Long Spruce project and earlier Limestone construction.

### Community Orientation Program for Bird

- An orientation session should be held in Bird to prepare residents of this community for the project and in particular for potential problems that might arise from the interaction of project workers with the community. During the Phase 3 liaison meeting, the elected band councillor from Bird expressed strong support for this measure and offered to help organize it.

  Manitoba Hydro is taking the lead to organize this session. Preliminary discussions with Fox Lake Band members indicate that the most suitable format for the session would be an "open house" in the community hall at Bird where residents could talk on a one-to-one basis with resource people about the Limestone project and its impacts on the community. A formally structured workshop likely would not be effective as it would be viewed by many local residents as intimidating and hence discourage them from attending. Relevant resource people would be representatives of Manitoba Hydro, the EIS study team, the RCMP and the Limestone Training and Employment Agency. The session should be held prior to the spring of 1986 when significant construction activity recommences. The "open house" is scheduled to be held on February 27, 1986 before the start of the main construction activity for 1986.

### Worker Orientation Program

- A worker orientation program should be undertaken to inform construction workers about environmental and socio-economic issues to which they should be sensitive. Programs of this type have become increasingly prevalent on major resource development projects in recent years and in all cases of which we are aware, have been undertaken by the resource developer. In response to this suggestion, Manitoba Hydro has indicated that it would develop and implement such a program.

  Components of a worker orientation program for the Limestone project include the following:

  1. basic orientation booklet;
  2. special information pamphlets;
  3. orientation meetings;
  4. special situation newsletters.

Each item is described further below. Of these, the basic orientation booklet is the most important. The orientation booklet and orientation meetings should be ready by the start of significant construction activity in the spring of 1986. Design of the orientation booklet is under way.

- A two-to-four page orientation booklet, complemented by a series of topic-specific pamphlets, should be developed and then distributed to all workers at the beginning of their work period on the Limestone project. The orientation booklet needs to be short to maximize the likelihood of its being read. It should contain key information about the project as well as items to which workers should be sensitive. For example, concerns about hunting and fishing pressures in certain areas and about disruptive behaviour on visits to nearby communities are important topics. An example of this type of booklet is the four-page orientation brochure supplied to construction workers during the second season of construction of the Norman Wells pipeline project. This booklet replaced a longer twenty-page orientation booklet that was used in the first year of construction.

- Topics meriting elaboration could be the subject of separate pamphlets, some or all of which would be distributed at the same time as the orientation booklet. Relevant topics for pamphlets include project description, local communities, fish, wildlife and northern policies. Information for the booklet and pamphlets could be supplied by the EIS study team.

  The orientation booklet and pamphlets could be given to workers living in camp when they register for their room and to workers living in Sundance when they register for their trailer site. This arrangement would ensure that all workers received the information at the start of their employment. For some pamphlets, a more selective or timely approach to distribution might be used. For instance, hunting and fishing licences are likely to be sold at the camp and copies of the pamphlets on wildlife and fish could be given to every worker purchasing a licence. Workers wanting to hunt and fish would be more likely to read the pamphlets at this time than when arriving at the project. As the project progresses there may be a need for a special pamphlet on a topical issue. Such a pamphlet could be put under every worker's door to ensure complete coverage of the site.

  In preparing the orientation booklet and pamphlets, the LGD of Gillam, Fox Lake Band, the local Conservation officer and the local RCMP should be consulted on relevant topics to ensure accuracy of content and appropriate local sensitivity.

- Orientation meetings could be held regularly to introduce new workers to the project and to regulations and concerns of which they should be aware. The frequency of the meetings would depend on the number of new workers arriving at the project. During some summer peak periods, there might need to be a meeting every two weeks, while in off-peak months once every three months may be sufficient. The meetings would be held at the construction camp in the evenings after work. Attendance would be voluntary since compulsory attendance will not be provided for in the contractor specifications. The voluntary approach was used at the Norman Wells pipeline project and it is estimated that over 70 per cent of the workers attended. New workers could be notified of the time and place of the next meeting in a handout accompanying the other orientation material. This information could also be posted in high traffic areas such as the dining room and the recreation centre. The handout and the orientation booklet should encourage workers to attend the next meeting.

The meetings should provide information to reinforce and embellish the orientation booklet. The meeting would ideally include presentations by the following:

1. someone who is knowledgeable about the project and the camp -- likely someone from Manitoba Hydro;
2. someone who can effectively discuss environmental concerns -- possibly the local Conservation officer;
3. someone who can effectively discuss socio-economic concerns -- possibly a local RCMP officer or a long-time resident of Gillam.

Due to the frequency of presentations, all presenters should live in the study area. The presentations should be relevant and entertaining to ensure good turnouts at future meetings. It may be difficult to get sufficient presenters at all meetings. To deal with this situation, there should be a self-contained slide tape program on each presentation area. This could be used when a presenter cannot attend or to complement live presentations made. Individual presentations and slide tape programs were used in the Norman Wells pipeline project orientation program.

- If a serious problem caused by construction workers emerges, then a special newsletter could be issued by Hydro management addressing the problem. This has been done on past hydro construction projects in special situations. The newsletter would be distributed to all workers or a targeted group, depending on what is appropriate.

## Orientation of Supervisors

- Of special significance is orientation of construction supervisors. They provide a role model for their subordinates and can be an important influence on their workers on and off the project site. Manitoba Hydro is planning to have compulsory orientation sessions for its Limestone construction supervisors. While these sessions are intended to deal primarily with native awareness, they should be extended to encompass environmental and local socio-economic considerations. The approach suggested above for worker orientation meetings also could be used for these sessions.

### Band Council Resolution to Control Visitors

- The Fox Lake Band could control visits by construction workers through a Band Council Resolution requiring all visitors to register at the Band office. The mechanics for implementing this would have to be resolved as it is not immediately apparent how this could be done in a manner that does not involve significant cost to the Band. In the absence of a comprehensive approach, the merits of a selective approach, where access to the reserve is open during business hours and controlled during evening and off-business hours, should be examined. The Department of Indian Affairs could assist the Band by supplying information about relevant experiences of other bands in establishing and implementing local by-laws to control visitors to the reserve. The Department has already initiated some work on this topic that might assist the Band.

### Informing Workers of Special Lay-off Provision

- Non-native construction workers should be informed about the special lay-off provision on the Limestone project at the time of referral. The Allied Hydro Council should ensure that all union halls are aware that they should inform workers of the provision before they travel to the site. As well, workers should be informed about the lay-off provisions in the orientation booklet.

### Extra RCMP Patrols Through Bird (determined to be redundant)

- In Discussion Paper #2, it was suggested that the RCMP should undertake extra patrols through Bird during the evening and on days when large numbers of workers have time off. Discussions with RCMP during Phase 3 indicate that, as a matter of normal practice, patrols through Bird would occur more frequently during the times suggested. Patrols are usually arranged to ensure better coverage in an area at times when the potential for problems is greater. The RCMP recognizes that Bird will be more susceptible to problems when Limestone construction workers are not working. It is important that the RCMP detachment in Gillam follow through with this practice and provide special patrols through Bird during Limestone construction. It is not sufficient to limit RCMP service to responding to specific requests from Bird residents.

**Band Constable for Bird (determined to be redundant)**

- It was suggested by a member of the Fox Lake Band during the Phase 2 liaison that a Band constable be established and located in Bird. This would ensure a continuous police presence in Bird during Limestone construction and, at the same time, meet "normal" policing needs of the Band. From the point of view of Limestone impacts, it is our understanding that policing requirements in Bird will be met by the RCMP detachment in Gillam, which would provide extra patrols in this community if necessary. Also, we understand that the detachment in Sundance can provide occasional support where special needs arise. A band constable for Bird merits consideration for Limestone related requirements only if the extra patrols are not provided and there is no special needs support from the Sundance detachment.

**Counselling Centre at Bird (determined to be redundant)**

- During the Phase 2 liaison meeting with the Technical Advisory Committee, it was suggested that a counselling centre be established at Bird to help residents cope with Limestone-related problems. However, the Fox Lake Band plans to move Band staff from Gillam, which includes an alcohol counsellor, to Bird before 1987. An additional counselling centre likely would be excessive in this context. In the interim, there is no need to establish a separate counselling service at Bird because:
    - Band members can make use of counselling services in Gillam and at the construction camp;
    - total size of the Bird population is small.

## 5.7 SOCIO-ECONOMIC MONITORING

### 5.7.1 Issues and Impact Management Needs

- It is important to monitor the evolution of potentially significant socio-economic impacts where their nature and magnitude cannot now be defined. Information provided by monitoring is needed to trigger timely and constructive responses in these areas. In this context, monitoring is needed with regard to:
    1. the nature and extent of problems arising from the presence of speculative in-migrants in the study area;
    2. the nature and extent of disruption that occurs due to visits by construction workers to Bird and Gillam.

- In addition to these single issue-oriented monitoring activities, broader based monitoring is needed for the following purposes:
  - To identify impacts that had not been anticipated in the EIS process. The most important source of unanticipated problems would be greater than expected population growth in Gillam during Limestone construction. The population of Gillam is not expected to increase by more than 300 people as a result of Limestone construction. This increase can be readily accommodated by the community. If, however, the increase exceeded 500 people, more intensive planning for housing and public services would be needed in the community. A monitoring program could help to anticipate greater than expected increases. For example, if there is a population increase of over 300 people in Gillam during 1986 when the project construction workforce has yet to peak, then it is reasonable to expect that the increase will be well in excess of 300 in 1987 when the workforce peak occurs. By knowing the increase in 1986, more accurate projections can be made for the peak years of 1987 and 1988. To address this requirement for population information and help identify other unanticipated socio-economic problems, an annual household survey of Gillam, Bird and Sundance from 1985 to at least 1988 and preferably to 1992, when construction ends, is needed. Since the last years of construction are also the first years of project operation there is no need to go beyond 1992. The 1985 survey would provide a baseline for assessing project-related population changes in future years.
  - To provide information that can be used to assess the impact of the proposed Conawapa project. For this purpose, a monitoring program is needed that covers the construction years of Limestone, the communities of Gillam, Bird and Sundance, and that focuses on changes in the following key socio-economic variables:

    a. population levels and characteristics;
    b. length of population residency in communities;
    c. direct and indirect project-related employment;
    d. local businesses initiated or expanded due to the project.

    The annual household survey referred to above would be the most appropriate means of obtaining this information.

### 5.7.2 **Monitoring Strategies**

Three monitoring strategies were identified during the EIS.

## Monitoring of Speculative In-Migration

- Monitoring of speculative in-migration should be undertaken to identify if and when a problem related to the topic arises and to serve as a trigger for some elements of the contingency plan.

  The most practical monitoring method is to involve those people providing "front line" services who are likely to receive information about newcomers to the area as a matter of course in their ongoing work. In their positions, some of these people tend to be the recipients of information, in particular, regarding newcomer-related problems which need to be addressed. These people are as follows:

  1. **LGD Administrator:**
     - receives information from LGD staff, Council members and others about the ongoing operation of the community (e.g., water, sewer, housing, recreation, fire protection);
     - as a matter of course, travels throughout the LGD and perceives problems first-hand;
     - is the full-time contact for problems to which ordinary residents can refer;
     - is the co-ordinator for the Emergency Measures Organization in the LGD.
  2. **Outreach Officer:**
     - takes job applications and refers people to training and employment;
     - specifically responsible for registration of local northerners for Limestone construction;
     - would be a logical point of contact for speculative in-migrants seeking work at the site.
  3. **Manitoba Hydro Staff:**
     - staff in the Gillam office or the camp would be another logical point of contact likely to receive inquiries from speculative in-migrants seeking work even though no hiring will be done from these offices.
  4. **Natural Resource Officers:**
     - these officers regularly travel throughout the LGD as part of their ongoing responsibilities and would be aware of newcomers, especially those camping on Crown land.
  5. **RCMP:**
     - RCMP officers regularly travel throughout the LGD and would be aware, in particular, if complaints were to arise from the presence of newcomers in the area.
  6. **Fox Lake Band and Social Services Staff:**
     - these groups may be sought out for financial assistance

by status Indian and non-status or non-native people respectively.

Given the size of the LGD and the relatively stable nature of the operations community of Gillam, newcomers are now easily recognized and probably will be noted by more than one of the seven contacts identified above. It is necessary to establish a point of central contact for all of these groups to co-ordinate, compile and identify action on the collective information. This would most logically be undertaken by the Resident Administrator of the LGD of Gillam. Informal linkages currently exist among many of the actors, e.g., six of seven contacts identified are located in the LGD building in Gillam and interact frequently. The monitoring system should be developed in conjunction with the contingency planning process as the information collected will provide a triggering mechanism for some parts of the plan.

## Monitoring of Worker Interaction

- A monitoring program should be implemented to determine nature, frequency and circumstances of worker interaction problems which might occur in Gillam and Bird.

  The most practical means of monitoring worker interaction problems is to record complaints relating to construction workers. Complaints would most probably be received by:

  - staff or councillors of the LGD;
  - council members and staff of the Fox Lake Band;
  - staff of Department of Community Health and Social Services in Gillam;
  - RCMP detachments in Gillam in Sundance;
  - senior Manitoba Hydro officials on the Limestone site.
  - natural resource officers

  These groups should keep records of complaints or problems arising from worker interaction with community residents. The Fox Lake Band and the LGD of Gillam should compile this information and initiate discussions with relevant groups to discuss anticipated or observed problems. If problems become significant, a committee or appropriate agencies may need to be established to review complaints and develop appropriate action.

## Annual Household Survey

- Discussion Paper #3 recommended that a comprehensive annual household survey be carried out in Gillam, Bird and Sundance until at least 1988. Manitoba Hydro has committed itself to funding these surveys and has contracted with the EIS consultants to carry out the 1985 survey. The Municipal Planning Branch in Thompson has agreed to provide technical advice and selected assistance.

The 1985 survey will occur over a five-month period from August, 1985 to December, 1985. Over this period the survey will be designed, administered, and a report prepared. Data gathering which occurred in October, is now completed. Local residents suggested avoiding the months of July, August and September, since many people are away on holidays or getting involved in school start-up activities during this time.

The survey covers all households in Gillam, Bird and Sundance and will obtain the following types of information:

1. population characteristics -- number, age, sex, grade (if in school), years in community, previous residence, Fox Lake Band affiliation;
2. employment characteristics -- employees, years with present employer, location of employment, nature of job;
3. housing characteristics -- type of dwelling;
4. reason for moving to study area for residents arriving in 1985;
5. effects of Limestone on household -- economic, social, service quality, other;
6. resident concerns about Limestone impacts and suggestions for addressing them.

The letter of introduction and questionnaire are shown in Appendix D. They have been reviewed with and approved by the LGD of Gillam and Fox Lake Band Councils. Letters of introduction were sent in advance to all residents. Four residents of the study area, including two members of the Fox Lake Band have been hired to assist in completing the questionnaires.

This was done by means of telephone and in-person interviews. Questionnaire information is being compiled in a computer data base and a report prepared for distribution by December. Since data gathering occurred after the start of construction, the analysis of the data will separate out Limestone-related workers and their families to provide a proper socio-economic "base line" that can be used as the basis for comparison in future years.

The survey report will be distributed to all groups who might find it useful to have an interest in it, including relevant staff in Manitoba Hydro, the LGD of Gillam, the Fox Lake Band, participants on the Technical Advisory Committee, the Thompson and/or Gillam offices of provincial and federal government agencies serving Gillam, and the Manitoba Energy Authority. Highlights will also be presented in an upcoming issue of "Limestone Update".

To make effective use of the survey results, there should be co-ordination among those organizations that can use or are affected by the survey information. The existing provincial TAC review process could function as the forum for review of progress regarding socio-economic monitoring and problem resolution.

Surveys in future years should be modified on the basis of lessons learned during 1985, but at the same time, they should be sufficiently similar to enable significant year-to-year comparisons of data.

## 5.8 LOCAL ECONOMY - EMPLOYMENT

### 5.8.1 Issues and Impact Management Needs

- A very important issue in the study area is ensuring that study area residents get the maximum opportunity to participate in project jobs. This view is supported by the following:
    1. There is a great deal of interest in the study area, particularly among members of the Fox Lake Band, in the construction and operations opportunities created by the Limestone project.
    2. For the Fox Lake Band, participating in project construction and operations jobs could reduce high unemployment rates among its members while, for Gillam, the operations jobs would help offset losses in permanent LGD and CNR jobs that have occurred in recent years.
    3. Significantly, all study area residents interviewed felt that employment opportunities are the overwhelming benefit of the project and that, provided local residents get their share of project jobs, the overall impact of the project would be positive. Providing local residents with project jobs is therefore very important in ensuring continuing local support for the project.
- Manitoba Hydro, the Manitoba Government and the relevant unions have established a major initiative to maximize northern resident employment in construction and operation of the Limestone project. As study area residents are also northern residents, they will be part of the target group for these initiatives. Furthermore, the proposed policies give priority consideration to northerners of native ancestry. This would include members of the Fox Lake Band who are the group with the greatest employment needs in the Limestone study area. The construction phase proposals are very extensive and include an elaborate pre-employment training program that will occur largely in Thompson, but also in other northern communities. A referral system will be established for the project using the existing network

of CEIC, Outreach and provincial employment offices located in northern communities and a special CEIC office located at the construction site.

- While the above measures give native northerners and northerners priority in accessing Limestone training and employment opportunities, they do not recognize the special needs and circumstances of study area communities and residents with respect to the Limestone project. In general, all communities are treated equally with respect to access to project training and employment opportunities. Being closest to the project, study area communities and residents will experience a greater share of adverse project effects than any other group. In view of this, they merit special consideration among northerners with respect to project benefits. It is important that the project manpower delivery system ensure that residents of the Fox Lake Band and Gillam get priority consideration particularly for training, which is an important conduit for project employment. In this regard, it is most important that residents of these communities are fully and promptly informed of all opportunities. Also, there must be an adequate and effective recruiting and referral capability for study area residents to ensure that the proposed northern employment programs work to their best advantage. Study area residents also merit priority with respect to those jobs created to manage and monitor the impacts of Limestone.

- Displacing key skilled residents of Gillam and the Fox Lake Band through their employment on the Limestone project should not create problems. In the prevailing economic environment, there should be little trouble finding replacements for people who leave existing jobs for Limestone employment. While temporary disruptions of services may occur, these should not be lengthy nor pose undue hardships. As far as possible loss of community leadership is concerned, this should be less of a problem for Gillam and the Fox Lake Band than for other northern communities due to their proximity to the project. Residents of Gillam and Bird could continue to reside in their home communities and participate in community activities while working on the Limestone project.

### 5.8.2 Impact Management Strategies

Four strategies were identified during the study, one was determined to be necessary and likely feasible, while three were determined to be redundant or unacceptable.

## Hire Local Residents for Impact Management and Other Jobs

- It was suggested during the Phase 2 liaison meeting with TAC that new jobs related to resource management and monitoring should go to qualified local residents wherever possible. This suggestion could be extended to cover the full spectrum of new jobs occurring in the study area that are not covered by the collective agreement for the Limestone project. While this is most desirable, it will be up to the employer implementing the measures (e.g., Department of Natural Resources for fisheries management) to carry through with a local hiring program. The Chairman of TAC should propose in writing to all groups undertaking impact management and monitoring programs in the Limestone study area that they should do as much local hiring as practical. This should be a regular topic of discussion at TAC review meetings.

## Employment Liaison Officer (determined to be redundant)

- It was suggested in Discussion Paper #2 that a separate employment liaison officer be established for the Fox Lake Band. Phase 3 discussions found that such a position is not necessary. It appears that the Outreach Office in Gillam will be able to address adequately the recruiting and referral needs of Band members with respect to Limestone. Discussions with the Outreach Office in Gillam indicate that Limestone employment opportunities will be the main and almost exclusive area of activity for the office in the foreseeable future, because there are very few employment opportunities in other sectors in the Limestone study area. Also, the office is sensitive to the needs of the native people in the area; it is staffed by a local resident of native ancestry. Discussions with the leadership of the Fox Lake Band confirmed this view. They felt that a Limestone employment officer for the Band would be redundant.

## Information About Limestone Training and Employment Opportunities (determined to be redundant)

- Discussion Paper #2 suggested that there be prompt and timely training and employment information supplied to the Limestone study area. Phase 3 discussion found that the Northern MLA's Committee, the Manitoba Energy Authority (MEA), and the Limestone Training Agency are devoting considerable effort to providing information about Limestone training and employment opportunities in the north. The Northern MLA's Committee and MEA deal with general information while the Limestone Training Agency deals with opportunity-specific information. The mechanisms that have been established or are planned include:

- meetings by the MLA's Committee with northern organizations;
- northern-specific mass media advertising of opportunities in general;
- a Thompson information office to respond to requests for Limestone opportunities information;
- brochures providing general information about opportunities;
- a periodic newsletter about Limestone employment and business opportunities;
- training of northern CEIC, Outreach and provincial government employment officers about Limestone training and employment opportunities;
- northern labour force inventories and follow-up with initial emphasis on the northeast quadrant which includes Gillam and Bird;
- a system for supplying timely information to northern employment officers about specific Limestone opportunities.

These mechanisms along with the Limestone open house, should be able to meet most of the information needs of the Limestone study area about project training and employment opportunities.

### Local Preference (determined to be unacceptable)

- The suggestion in Discussion Paper #2 of giving priority consideration for Limestone training to Fox Lake Band members within the northern native preference and Gillam residents within the northern residence preference was considered and rejected by the Interim Board of the Limestone Training and Employment Agency. The Board felt it would be "difficult and unwise to give priority preference within the preference boundary". It was noted, however, that individuals with past experience in hydro construction would have a natural and automatic advantage in either upgrading their skill levels or obtaining direct employment on the Limestone project. This would give an advantage to residents of Gillam and the Fox Lake Band since they have been more heavily involved with past hydro construction projects than most other northern commmunities. If this will happen automatically, then there is no need for further action on this suggestion.

## 5.9 LOCAL ECONOMY - BUSINESS

### 5.9.1 Issues and Impact Management Needs

- A concern with regard to local business, particularly in Gillam, is the possible limited degree to which businesses may benefit from project construction. Experience with Long Spruce, the new road to Thompson, the existence of Sundance and the existence of a self-contained camp are factors contributing to this concern. The Gillam business community is especially concerned that businesses established in Sundance may detract from their own businesses.

- The Fox Lake Band is actively pursuing business opportunities directly related to Limestone. Most of the efforts of the Limestone impact co-ordinator are devoted to getting project-related business. In light of this, it is desirable for the Band to obtain some Limestone-related business. If this does not happen, the Band might become discouraged regarding opportunities at Limestone and this might spill over into a negative attitude towards future downstream development. They see the project-related opportunities as an important vehicle for their economic development. Some businesses in Gillam are interested in pursuing opportunities that may emerge from the project, especially in Sundance.

- Dangers of anticipatory over-expansion by the business community are not of concern due to the considerable business experience which already exists in the community from two previous construction projects (Kettle and Long Spruce). However, the project may exacerbate the movement of transient salesmen (i.e., operating door-to-door, from hotel rooms or from vehicles) to Gillam; this phenomenon has already begun with the road opening. During construction, this in-migration has the potential to affect the local business community adversely.

### 5.9.2 Impact Management Strategies

Three strategies were identified during the study to address this issue; two were determined to be necessary and likely feasible and one was determined to be impractical.

**Special Attention to Initiatives of Fox Lake Band**

- The suggestion in Discussion Paper #2 that special attention be given to the business initiatives of the Fox Lake Band is already being addressed to a considerable extent in the following ways: the Manitoba Hydro staff responsible for promoting northern business participation in its project maintains regular contact with the Fox Lake Band's Limestone co-ordinator. An "alert" information system has been established to advise the Fox Lake Band and other northern native groups about pending contract and lease opportunities well in advance of the issuing of tender documents. Prospective tenderers are being informed about the interest and capability of the Fox Lake Band and other northern native groups in participating in project business opportunities. Efforts have also been made to help identify joint venture partners for contracts that the Band might pursue. However, in view of the importance of this strategy, we recommend that Manitoba Hydro and the Manitoba Energy Authority also implement the following measure if necessary:

- designate certain contracts as community contracts to be negotiated with the Fox Lake Band, similar to the approach used on the Norman Wells pipeline project. This measure is relevant if it appears that the other measures will not succeed in enabling the Band to get a Limestone-related contract and the Band maintains its interest in obtaining such contracts.

## Information for Gillam Business Community

- Discussion Paper #3 suggested that the Northern MLA's Committee and Manitoba Hydro should meet with the Gillam business community as soon as possible to inform them of the plans for Sundance businesses and obtain their feedback regarding how this might affect Gillam businesses. Gillam businesses should receive, at the same time, pertinent information regarding northern business policies, business opportunities related to Limestone and key project description information. The Manitoba Energy Authority should also ensure that pertinent materials produced by them are distributed to each Gillam business.

  Aside from a dialogue about concerns related to the choice of Sundance businesses, most of the intents of these suggestions were achieved by a Limestone Purchasing Seminar held in Gillam in early June. Conducted by the Manitoba Department of Industry, Trade and Technology, the seminar was attended by nearly every business person in Gillam.

## Transient Traders (determined to be impractical)

- Discussion Paper #2 suggested that options for controlling in-migrant transient sales people going to Gillam during Limestone construction be provided. Phase 3 discussions with the LGD of Gillam indicate that very little can be done to restrict transient sales people from doing business in Gillam. In 1968, the LGD enacted a by-law that requires transient traders and sales people wishing to do business in the community to obtain a licence. An annual fee of $20 is charged for the licence. While this enables the LGD to keep track of such businesses, it does not provide any control over their activities. Regulations under the Municipal Act do not permit municipalities to take any stronger measures to control such businesses. In this context, the only control available is consumer purchasing behaviour. During our Phase 2 liaison meeting with the LGD of Gillam Council, the observation was made that transient traders may not end up being much of a problem in Gillam in any event. Sundance, with its new and growing population, is likely to be the main attraction in the area for such people. Manitoba Hydro should be prepared for this possibility.

## 5.10 TRAFFIC

### 5.10.1 Issues and Impact Management Needs

- One of the borrow pits (Bird VII) that could be used for the Limestone project is situated north of the community of Bird in an area that the Fox Lake Band is currently considering as an extension to its reserve to complete the settlement of its treaty entitlement. If this borrow pit is used, a new access road would have to be developed that extends from the existing road that is adjacent to Bird. At the peak of construction, an estimated four trucks per hour could be using this road. This could create noise and dust for the community. It will also increase traffic encountered by residents of Bird who use this road.

### 5.10.2 Impact Management Strategies

During the study, two strategies were identified to address this issue; one was determined to be necessary and likely feasible, the other was determined to be redundant.

#### Use Bird I Borrow Site

- Discussion Paper #2 encouraged development of the Bird I borrow site north of the Limestone River to eliminate hauling traffic past Bird that would accompany development of the Bird VII site. Upon their review of Discussion Paper #2, the Chief and Limestone Co-ordinator for the Fox Lake Band have indicated that they are very interested in having the Bird VII site developed. Even though this will result in considerable hauling traffic and associated noise and dust near the community of Bird, their main interest is the development of an access road into their contemplated reserve area which could be used in the future by Band members. On the other hand, at least one Band councillor preferred to avoid developing the Bird VII site to keep traffic near the community down. The General Civil Contractor has decided to develop the Bird I site and not to develop the Bird VII site north of Bird.

### Consult with Fox Lake Band on Bird VII Access Road (redundant)

- Since the location of the access road is very important to them, the Fox Lake Band has asked to be consulted on this matter, if Bird VII is selected as an aggregate site. However, as the Bird VII site is not going to be developed, this strategy is redundant.

## SELECTED REFERENCES - CHAPTER 5

Cornerstone Planning Group. Development of Socio-Economic Principles and Practices. 4 volumes. Calgary: Gulf Canada Resources Inc., 1980. 294 pages.

DePape, D. and R. Cairns. PCC Wrap-Up Review of Norman Wells Project: Proceedings and Papers. Yellowknife. 150 pages.

Denver Research Institute. Socio-Economic Impacts of Western Energy Resource Development. 4 volumes. Denver, Colorado, 1979.

Geisler, C.C. et al. Indian SIA: The Social Impact Assessment of Rapid Resource Development on Native People. University of Michigan, Natural Resource Sociology Research Laboratory, Monograph #3, 1982. 256 pages.

Gilmore, J.S. "Socio-Economic Management: Are Impact Assessments Good Enough to Help". Paper at Computer Models and Forecasting of Growth and Development Conference. Jasper, Alberta, 1980. 22 pages.

Hilderman, Feir, Witty and Associates. Fox Lake Band: Bird Townsite. Winnipeg, 1978. 124 pages.

Hydro Projects Management Association. Submission to Mega Projects Task Force. Winnipeg, 1980. 33 pages.

Indian and Northern Affairs Canada. "The Norman Wells Case Study". Presented at Banff Centre Seminar on Project Assessment: Project Audit. Banff, 1984. 30 pages.

Indian and Northern Affairs Canada. Indian Reserve Community Profiles 1983. Winnipeg, 1984.

InterGroup Consulting Economists Ltd. Socio-Economic Impact of Phase 2 of the Cluff Lake Project. Saskatoon: Cluff Mining. 196 pages.

Justus and Simeonetta Development Consultants Limited. Major Resource Impact Evaluation. Vancouver, 1979. 155 pages.

Knowles, J.A. Socio-Economic Analysis and Projections for Gillam, Bird and Sundance. Toronto: Polar Gas, 1978. 121 pages.

Kopas, P. The Structure and Functions of the Revelstoke Impact Monitoring Program. Social Impact Assessment. 1980. 51/52: 3-10.

Lang, R and A. Armour. The Assessment and Review of Social Impacts. Ottawa: Federal Environmental Assessment Review Office, 1981. 163 pages.

Larson, L.E. The Impact of Resource Development on Individual and Family Well Being. Edmonton: Alberta Oil Sands Environmental Research Program, 1977. 182 pages.

Leistritz, L., et al. Socio-Economic Impact Management. Boulder, Colorado: Westview Press, 1984. 248 pages.

Leistritz, L. and R. A. Chase. "Socio-Economic Impact Monitoring Systems: Review and Recommendations". Paper presented at Second International Forum on the Human Side of Energy, Edmonton, 1981. 25 pages.

Lower Nelson Overview Study Team. The Lower Nelson Overview Study. Winnipeg: Manitoba Hydro, 1981. 251 pages.

MacLaren/InterGroup. Summary of Phase II Local Area Interview Program: Limestone EIS. Winnipeg, 1985. 30 pages.

Manitoba Economic Development and Tourism. 1981 Manitoba Community Reports. Winnipeg, 1982.

Manitoba Hydro. Burntwood-Nelson Collective Agreement. Winnipeg, 1984.

Mitz, William C. "The Mitigation of Socioeconomic Impacts by Electric Utilities" in Public Utilities Fortnightly 106(1):34-42.

Municipal Planning Branch. The Local Government District of Gillam Zoning By-law No. 335 Gillam. Thompson, 1984. 82 pages.

Municipal Planning Branch. The Local Government District of Gillam Development By-law No.258 As Amended. Thompson, 1984. 37 pages.

Municipal Planning Branch. The Local Government District of Gillam By-law No.334. Thompson, 1984. 5 pages.

Taunton, G.F. Baseline Socio-Economic Profile of Northern Manitoba. Toronto: Polar Gas, 1978. pp.129-194.

Statistics Canada. "Selected Social and Economic Characteristics: Manitoba", 1981 Census, 1982. pp.228-232.

Urban Consultants Ltd. A Study of the Impact of Construction Camps on the People of Northeast Alberta. Edmonton: Alberta Oil Sands Environmental Research Program, 1980. 121 pages.

# Chapter 6

# CHAPTER 6

# CO-ORDINATION OF LIMESTONE PROJECT IMPACT MANAGEMENT

## 6.1 BACKGROUND

The Environmental Impact Study (EIS) has developed a monitoring/mitigation program to assist in the management of Limestone project impacts. A 10 year program will be implemented beginning in 1985 and continuing after the EIS report is complete. The need was recognised to ensure that the ongoing impact management program is co-ordinated and that information developed throughout the program is available as feedback to all interested parties, particularly those parties that were directly involved in dialogue throughout the study. In many ways, the EIS report is the beginning of a long-term impact management program. Program results will be required for interpretation and assessment by planning/policy-makers, and to assist in modifying resource management programs as required to meet changing conditions or objectives. Thus, the information must be made available (perhaps in different formats) to a wide readership, including resource managers, project proponents, local groups, and policy-makers.

To date, the co-ordinating mechanism for the development and initiation of the recommended impact management program has been the Technical Advisory Committee (TAC) structured through MEARA and IPB. This program has conformed to the scope of work designated for the EIS. The project proponents, the EIS study team, and Provincial resource managers have been represented on the TAC, which has reviewed the EIS Study Plan, Discussion Papers #2 and #3, and the draft Final Report. There also has been liaison with various federal government department representatives (e.g., DIAND, EPS, DFO, HWC, etc.), some of whom were present and participated at TAC meetings after Phase 1 of the EIS review process. These federal representatives reviewed Discussion Papers #2 and #3 and the draft Final Report. As well, local meetings with the public, elected representatives, and special interest groups have been held at periodic intervals throughout the study at which the TAC was represented.

In the study team's opinion, the TAC has been an appropriate vehicle for initiation and co-ordination of recommended impact management programs in the short-term (e.g., 1985 and 1986), and could function as an equally appropriate forum for review of initial program results, and accordingly, for planning and co-ordination of longer-term programs. The need to ensure longer-term program execution is paramount to satisfy the information needs and expectations of local resource harvesters and social service delivery agencies, provincial and federal government scientists and resource managers, and elected officials. This is especially important in the context of future, downstream hydro development(s). Accordingly, attention has been focused in Phase 4 of the EIS to appropriate structures or mechanisms needed to ensure continuity of impact management after the EIS and project construction are complete.

## 6.2 RATIONALE FOR IMPACT MANAGEMENT CO-ORDINATION

The logic supporting the need for a co-ordinated, longer-term impact management process is based on several facts:

- Impact management at the scale of the "megaproject" requires the involvement of a wide spectrum of regulatory and management agencies.
- There exists a wide range of inspection, regulatory and permitting agencies which, as part of their normal responsibilities, will monitor routine project matters, especially from the compliance perspective.
- Those agencies include various departments within the federal and provincial governments which routinely tend to function relatively independently, without consistent co-ordination, in fulfillment of their individual mandates.

- It is important for key agencies to keep each other informed about ongoing project-related information and plans. This can help to avoid potential problems, and can assist in developing plans to meet changing conditions in a cost-effective, non-duplicative manner.
- The information generated by regulatory, management and inspection agencies will be of widespread interest, and must be made available to a range of audiences (resource managers, project proponents, local groups, elected policy-makers).
- Some types of impacts may not be anticipated or may require a multi-disciplinary response involving several agencies.
- Many impacts are uncertain in their timing and a mechanism is needed to provide ongoing information to deal with uncertainties.

## 6.3 PROPOSED MECHANISM FOR ONGOING IMPACT MANAGEMENT

For the foregoing reasons, it is clear that the co-ordinated, multi-disciplinary, and cost-effective execution of impact management programs, with the capacity to respond to unanticipated problems, is a complex task. The existing TAC, convened to review the progress of the Limestone EIS, provides a cross-section of relevant provincial departments (Figure 6-1). A representative of the Secretary to the Social Resources Committee of Cabinet has been added to the departmental representation to ensure adequate coverage of social issues.

The TAC is well-suited to serve as a vehicle to co-ordinate the assembly of monitoring/mitigation information for the various user groups. Representatives of TAC can provide specific information on monitoring programs as well as information on routine inspection/monitoring activities carried out by their Departments. TAC is also suited to arrange for the dissemination of the data, results, feedback, etc., to representatives in the local area, the proponents, as well as to policy-makers in the provincial government. It was thus previously recommended (Discussion Paper #3) that the TAC review the progress of impact management, including the extent to which mitigation and monitoring programs proposed in Discussion Paper #3 of the EIS were being carried out. In response, the Provincial Land Use Committee (of Cabinet) endorsed this recommendation of the study team.

Following the issuance of Discussion Paper #3 (in May 1985), consultation between the federal Minister for Indian Affairs and Northern Development and the provincial Minister of Energy and Mines resulted in a provincial commitment to a more formalized federal-provincial relationship of program review and co-ordination, extending into the operations phase of the project. The proposed provincial/federal Limestone Environmental Impact Liaison Committee is an appropriate vehicle, in the view of the study team, and should be integrated with ongoing TAC review. This can be readily accomplished by having the TAC chairman as a member of the Impact Liaison Committee, with the responsibility for integration of the process. In this way, close co-ordination of the TAC and the federal/provincial committee would be ensured and communication of information of mutual interest to the two groups would be optimized.

Figure 6-1 depicts the above-described concepts, including the relationship between the TAC and the proposed provincial/federal Impact Liaison Committee. The interlocking of the two structures is simple, maximizes continuity from the EIS study, and provides a means to deliver ongoing information to the range of user groups involved.

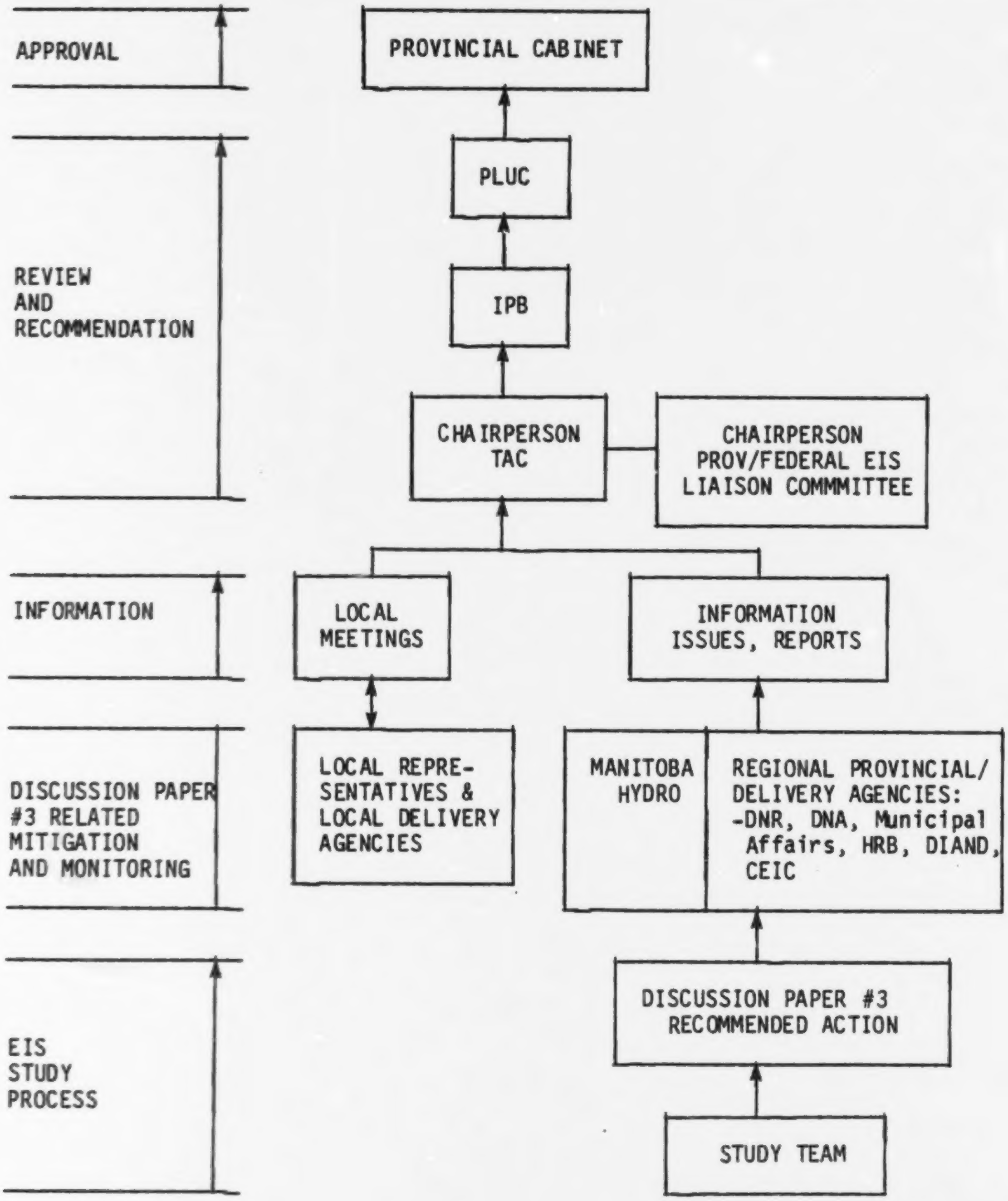
## 6.4 LOCAL INVOLVEMENT

It is very important to provide information to the local area and to receive information and feedback from the local area during the implementation program. During the EIS study process, the study team carried out regular local meetings, arranged by Manitoba Hydro and attended by the TAC chairman, to serve this purpose.

Once the EIS is completed, the TAC should organize periodic meetings in the local area with the LGD of Gillam Council and the Fox Lake Band Council, with local interest groups and representatives of delivery agencies as part of its ongoing consultation and co-ordination function. There also should be regular contact between the Chairman of TAC, the Administrator of the LGD of Gillam and the Chief of the Fox Lake Band to review emerging issues and concerns related to Limestone and discuss progress on the mitigation and monitoring programs. These discussions could provide the main basis for timing and content of meetings in the local area. If the need arises for a more formalized communication structure between the TAC and the local communities, a local impact co-ordinating committee, comprised of a cross-section of local organizations could be established.

FIGURE 6-1

CO-ORDINATION MECHANISM - LIMESTONE IMPACT MANAGEMENT


APPROVAL
PROVINCIAL CABINET
PLUC
REVIEW AND RECOMMENDATION
IPB
CHAIRPERSON TAC
CHAIRPERSON PROV/FEDERAL EIS LIAISON COMMMITTEE
INFORMATION
LOCAL MEETINGS
INFORMATION ISSUES, REPORTS
DISCUSSION PAPER #3 RELATED MITIGATION AND MONITORING
LOCAL REPRESENTATIVES & LOCAL DELIVERY AGENCIES
MANITOBA HYDRO
REGIONAL PROVINCIAL/ DELIVERY AGENCIES: -DNR, DNA, Municipal Affairs, HRB, DIAND, CEIC
EIS STUDY PROCESS
DISCUSSION PAPER #3 RECOMMENDED ACTION
STUDY TEAM

# Appendices

# APPENDIX A

# LIST OF CONTACTS

## APPENDIX A

## PEOPLE CONTACTED DURING LIMESTONE EIS*

| Name | Organization/Group |
|---|---|
| GOVERNMENT | (Winnipeg unless otherwise indicated) |
| G. Dickson | Dept. of Culture, Heritage and Recreation |
| B. Carmichael | Dept. of Natural Resources, Fur Unit |
| V. Crichton | Dept. of Natural Resources, Wildlife |
| M. Gaboury | Dept. of Natural Resources, Fisheries |
| J. O'Connor | Dept. of Natural Resources, Fisheries |
| A. Derksen | Dept. of Natural Resources, Fisheries |
| G. McVittie | Dept. of Natural Resources, Fisheries (Thompson) |
| R. Schlick | Dept. of Natural Resources, Fisheries (Thompson) |
| D. Cook | Dept. of Natural Resources, Fisheries (Thompson) |
| A. Houle | Dept. of Natural Resources, Parks |
| I. McKay | Dept. of Natural Resources, Fur Unit |
| B. Carmichael | Dept. of Natural Resources, Fur Unit |
| S. Smithson | Dept. of Natural Resources, Water Resources Branch |
| F. Penner | Dept. of Natural Resources, Water Resources Branch |
| R. Smithson | Dept. of Natural Resources, Water Resources Branch |
| B. Wright | Dept. of Natural Resources, Fisheries (The Pas) |
| S. Kearney | Dept. of Natural Resources, Wildlife (Thompson) |
| L. Bowles | Dept. of Natural Resources, Wildlife |
| R. Larche | Dept. of Natural Resources, Wildlife |
| M. Gillespie | Dept. of Natural Resources, Wildlife |
| A. Briggs | Dept. of Natural Resources, Forestry |
| E. Nielson | Dept. of Energy & Mines, Geological Services |
| D. Thompson | EMD (Dept. of Environment & Workplace Safety) |
| B. Blunt | EMD (Dept. of Environment & Workplace Safety) |
| K. Moche | EMD (Dept. of Environment & Workplace Safety) |
| K. Plews | EMD (Dept. of Environment & Workplace Safety) |
| D. Admiral | Freshwater Fish Marketing Corp. |
| C. Katapodis | Freshwater Institute, Dept. of Fisheries and Oceans |
| M. Pabst | Freshwater Institute, Dept. of Fisheries and Oceans |
| D. Bodaly | Freshwater Institute, Dept. of Fisheries and Oceans |
| L. Dominy | Fish Habitat Management Branch, Dept. of Fisheries and Oceans (Ottawa) |
| T. Sudol | RCMP |
| B. McCossan | RCMP |
| R. Chamberlain | RCMP |
| B. Wiebe | RCMP |

---

*List excludes personnel on Technical Advisory Committee

| | | |
|---|---|---|
| F. Campbell | CNR | |
| S. Mackintosh | CNR | |
| H. Sayant | Transport Canada | |
| B. Johnston | Dept. of Highways and Transportation | |
| B. Connell | Dept. of Indian and Northern Affairs, Resource Development Impact Group | |
| G. Tencha | Dept. of Municipal Affairs, Municipal Planning Branch | |
| R. Fenwick | Dept. of Community Services and Corrections | (Thompson) |
| B. Ghostkeeper | Dept. of Economic Security and Employment Services | (Thompson) |
| B. McCrossan | RCMP | |
| L. Turnbull | Manitoba Energy Authority | |
| J. Marowitch | Dept. of Municipal Affairs, Municipal Planning Branch | (Thompson) |
| M. Boreskie | Dept. of Municipal Affairs, Provincial Planning Branch | |
| N. Carrol | Dept. of Municipal Affairs, Municipal Planning Branch | |

## MANITOBA HYDRO

| | |
|---|---|
| W. Everett | |
| R. Hlady | |
| A. Whitcomb | |
| D. Dawson | |
| D. Windsor | |
| B. Osiowy | |
| P. Porter | |
| D. Pashniak | Crippen Acres Engineering |

## GILLAM

| | |
|---|---|
| D. Spence | Outreach Office |
| F. Beardy | trapper, Gillam Fur Council |
| B. Monkman | trapper, Gillam Fur Council |
| E. Zelenisky | trapper, Gillam Fur Council |
| J. Lockhart | trapper, Gillam Fur Council |
| D. Massan | trapper, Gillam Fur Council |
| A. Massan | trapper, Gillam Fur Council |
| R. Beardy | trapper, Gillam Fur Council |
| G. Miles | trapper, Gillam Fur Council |
| B. Champagne | businessperson, long time resident |
| G. Hanna | LGD administrator |

| | |
|---|---|
| L. Price | former LGD administrator (now in south) |
| B. Winner | recreation commissioner, long time resident |
| P. Chaney | RCMP |
| G. Stillmack | principal of Gillam School |
| B. Semenchuk | CN agent, long time resident |
| T. Bartlett | hospital administrator |
| M. Rodnisky | hotel manager |
| D. Reimer | businessperson, long time resident |
| Mr. & Mrs. Jordan | businesspeople, long time residents |
| K. Sigurdson | businessperson, long time resident |
| G. Streifel | businessperson, long time resident |
| P. Dale | businessperson, long time resident |
| K. Astrop | businessperson, long time resident |
| W. Recus | businessperson |
| R. Legary | mayor |
| B. Cox | long time resident |
| H. Salewski | Manitoba Hydro |
| C. Turner | Manitoba Hydro |
| R. Clinton | Fur Officer, Dept. of Natural Resources |
| D. Maxwell | Conservation Officer, Dept. of Natural Resources |

## FOX LAKE BAND

| | |
|---|---|
| L. Kirkness | former Chief |
| R. Neckoway | |
| L. Neckoway | |
| C. Wavey | |
| M. Redhead | Chief |
| M. Beardy | |
| Mr. & Mrs. Ouskin | |
| P. Massan | |
| G. Moose | |
| E. Garson | |
| R. Wavey | Limestone Co-ordinator, Fox Lake Band |
| Mr. & Mrs. Hill | |

## SUNDANCE

| | |
|---|---|
| M. Porter | principal of Sundance School, long time resident of area |

## OTHER

| | |
|---|---|
| B. Mahnic | Interprovincial Pipelines (NW) Ltd. (Edmonton) |
| J. Talbot | former Director of Community Services (Tumbler Ridge, B.C.) |
| G. Paget | B.C. Dept. of Municipal Affairs |
| G. Scobie | B.C. Dept. of Industry and Small Business |
| J. Mar | Norman Wells Project Co-ordination Office |
| R. Roberts | Praxis, re: Ft. McMurray experience |
| R. Wallace | Saskatchewan, Dept. of Natural Resources |
| D. Roy | Societe d'Energie de la Baie James |
| D. Kiell | Manager, Environmental Services, Newfoundland & Labrador Hydro |
| K. Schwalme | Department of Zoology, University of Alberta |
| P. Ruggles | Montreal Engineering Limited |
| F. Meth | Director Environmental Planning, New Brunswick Electric Power Commission |
| G. Gillis | Washburn & Gillis Associates Ltd. |
| P. Patrick | Ontario Hydro |

## MEMBERS OF LIMESTONE TECHNICAL ADVISORY COMMITTEE

| Name | Organization/Group |
|---|---|
| M. Boreskie (Chairman) | Provincial Planning Branch |
| B. Blunt | Environment Assessment & Review Services Branch |
| D. MacLure | Municipal Services Branch |
| G. Bossenmaier | Resource Allocation, Dept. of Natural Resources |
| G. Dickson | Historical Resources Branch |
| R. Kristjanson | Energy Economics Branch |
| G. MacLean | Manitoba Energy Authority |
| A. Goldsmith | Executive Council |
| D. McRitchie | Geological Services Branch |
| J. Romeo | Department of Highways |
| N. Brandson | Environmental Management Services |
| B. Dagdick | Affirmative Action Branch |
| J. Morrisseau | Northern Affairs |
| N. Carroll/S. Houghton | Municipal Planning Branch |
| W. Everett | Manitoba Hydro |

---

## LIMESTONE ENVIRONMENTAL IMPACT LIAISON COMMITTEE*
## FEDERAL REPRESENTATIVES

| | |
|---|---|
| P. F. Cochrane | Medical Services Branch |
| A. H. Macpherson | Environment Canada |
| B. Briscoe | Environmental Protection Service |
| R. A. Halliday | Inland Waters Directorate |
| P. Boothroyd | Canadian Wildlife Service |
| L. Renooy | Department of Indian and Northern Affairs |
| R. Josephson | Department of Fisheries & Oceans |
| G. Stewart | Canadian Coast Guard |
| C. P. Fisher | Canadian Coast Guard |
| G. H. Lawler | Freshwater Institute |
| C. Katopodis | Department of Fisheries & Oceans |

*In addition, all members of the Limestone Technical Advisory Committee are members of this Committee.

# APPENDIX B

# ISSUES NOT EXPECTED TO REQUIRE IMPACT MANAGEMENT

# APPENDIX B

## ISSUES NOT EXPECTED TO REQUIRE IMPACT MANAGEMENT

This appendix contains issues which are considered not to require impact management. The rationale for removing these issues from further analysis is outlined in each case. Issues are eliminated for the following reasons:

1. issue not of concern;
2. impact management is already planned;
3. not amenable to impact management.

### BIOPHYSICAL ISSUES

### GEOMORPHOLOGY - FLOODING

- Less than 300 hectares were predicted to be flooded (Penner et al. 1975), almost all at mouths of tributary creeks close to Long Spruce station (e.g., Clements, Brooks). Relative to the expected magnitude of flooding associated with previous or future hydro-electric developments, this amount is relatively insignificant.

### WATER QUALITY - MERCURY AND SUSPENDED SEDIMENT

- Information from Canada/Manitoba Mercury Monitoring Agreement indicates biggest factors affecting mobilization from soils are:

  1. area of flooded land;

  2. total surface area of flooded organics.

  Because so little land is expected to be flooded and because relatively little organic overburden is present in these soils, the potential for mercury mobilization attributable to the project is very low. Monitoring activities beginning in the summer of 1985 will include limited surveillance of mercury content in erodable soil and in local fish catches, to verify the present low levels, and to establish a baseline for comparison with future monitoring results.

- Limited water quality monitoring of suspended sediment will be conducted by Manitoba Hydro (as is done at other generating stations) to assist estimation of erosion effects on water quality. These data (and other data) might be used to calibrate satellite imagery, used to track suspended sediment concentrations over time.

## WILDLIFE - AVIAN POPULATIONS (EAGLES)

- Six eagles were observed in November 1984 in the area from Long Spruce to Lower Limestone Rapids. They will be displaced by construction stress, but will likely return after construction has finished.
- The usual threat to eagles from hydro development is shoreline flooding. Eagles nest on tree-tops at water's edge; flooding causes trees to topple into the forebay, and the eagles move away rather than rebuild at the next line of trees. Since there is likely to be so little flooding, there isn't the same kind of risk to eagles.

## ECOSYSTEM - DOWNSTREAM ESTUARY

- The Hudson Bay estuary is too far away for pronounced impacts or accumulation effects to be seen. In addition, concerns for more downstream impacts will be addressed in appropriate studies pertaining to more downstream developments (e.g., Conawapa).
- Some increase in suspended solids during construction may increase delta formation in the estuary but this process is historic and natural. The river is already regulated by Long Spruce, so changes to vegetation on the delta likely already have occurred.
- There is some threat of increased hunting stress, due to increased access by relatively well-paid workers who buy jetboats to go fishing or hunting downriver. If this happens, the biggest impact may be on migratory Canada geese in fall, which are protected by laws enforced by local Conservation Officers.

## FORESTRY

- There is little merchantable timber in the study area. The Lower Nelson Overview Study (1975) states that no merchantable timber will be flooded by construction of the Limestone dam.

## SOCIO-ECONOMIC ISSUES

### WORKER IN-MIGRATION

### Construction Phase

**Gillam**

- During construction, no significant population change is expected to result from the addition of direct project workers, other workers in spin-off jobs and their families to Gillam; in total, no more than 300 new people are expected in the peak year of construction. With this addition the town population will approximate or marginally exceed the 1981 level and will be almost half of the 1976 level. The relatively small increase in population occurs because:

  1. the vast majority of construction workers and their families will reside in the Limestone camp and the Sundance townsite;
  2. spin-off employment in Gillam will be quite small.

  All services and infrastructure of the community have ample physical capacity to accommodate this change and can readily make the needed changes in operating capacity.

**Sundance and Bird**

- No concern is raised for population change in these two communities because access to both is controlled by policy:

  1. By Manitoba Hydro policy, anyone moving to Sundance must have a job with Manitoba Hydro or be a contractor of Manitoba Hydro, or be a designated operator of a retail business in Sundance;
  2. In Bird, the Fox Lake Band will allow only members of the Fox Lake Band to move to housing units currently being prepared for them at Bird. There are no plans to establish any form of trailer park or accommodation for construction workers.

### Operations Phase

- In-migration of less than 30 operations workers and their families to Gillam raises no concerns; infrastructure and service capacity of the community are ample to accommodate the change.

- Since Sundance is a construction phase community only, no population is expected to reside here during operations phase.

## LOCAL GOVERNMENT

- No issue is anticipated with regard to local government.
- No changes would be required in the administrative agreement between Manitoba Hydro and the LGD of Gillam with the addition of the project to the region.
- Similarly, administrative relationships (under agreements) with Frontier School Division (re: Gillam and Sundance) and the Gillam Hospital appear satisfactory to accommodate any changes resulting from Limestone project during construction and operations phases.

## LOCALLY PROVIDED PUBLIC SERVICES

- During construction and operation, no issue is anticipated with regard to publicly provided services (sewer and water infrastructure, public works, fire protection) because physical capacities of publicly provided services are well in excess of peak anticipated population levels of about 1,400 people during the construction period.

## TRANSPORTATION SERVICES

- No issue is anticipated in transportation services during the construction phase. The quality and availability of service to the region and the capability to expand indicate that no shortage is anticipated in rail, bus, truck or air services.
- Additional transportation demands may in fact improve some services (e.g., daily flights to Winnipeg) as was the case during the Long Spruce project. New airport terminal and maintenance buildings are being contemplated for Gillam, but no firm decision has yet been made.

## COMMUNICATION SERVICES

- No issue is anticipated with regard to communication services in the local area during construction or operations phases.

- No capacity shortage was noted during the Long Spruce project nor is expected during the Limestone project.

## SCHOOLS

- No issue is anticipated with regard to providing schooling for children of construction workers or others new to the local area during the construction phase. This also applies to operations workers during the operations phase.
- The physical capacity of Gillam and Sundance schools are adequate to accommodate the peak anticipated demand, although the latter may require enlargement.
- In Gillam, added students in the elementary grades may necessitate the addition of some staff because these grades currently operate with higher than average student-teacher ratios. However, in the high school, additional students (including those bussed from Sundance) will enhance the ability of the school to offer a full curriculum since the current enrollment means that class sizes are well below average.
- No issue is anticipated with regard to providing schooling for children of operations workers based in Gillam.

## HEALTH CARE

- No issue is anticipated with regard to the Gillam hospital during the construction (or operations) phase because:
    1. much of the project-related health requirements during construction will be provided at Sundance and the construction camp;
    2. the health facility and staff are currently underutilized;
    3. renovation plans for the hospital will add fifty per cent more space by March of 1986;
    4. out-patient services, which did experience a capacity strain during Long Spruce, will likely not experience the same problems this time due to the Sundance clinic;
    5. demands of the construction project may in fact help the facility to attract and retain professional and technical staff.
- Capacities of the facilities and staff will be well above what is required to service the new operations workforce; total population will approximate the post-Long Spruce 1981 population level.

- Bird residents, who will use Sundance and Gillam facilities in the immediate future, plan to have their own health care facility eventually; this facility may be in place by the time the Sundance facility is closed.

## LIFESTYLE AND COMMUNITY COHESION

- The presence of a construction project with the magnitude of Limestone in terms of activity and people is likely to have a marked effect on the lifestyle of Gillam, Bird and the entire LGD of Gillam over the years of construction. However, the degree to which change in the community is incremental to changes initiated during Kettle and Long Spruce construction is a matter of opinion. Many key people interviewed, especially long term residents who were in Gillam before Kettle or early in that project, felt that the most dramatic changes occurred then and that, in some respects, the course of the community was also established then.

- Gillam changed dramatically, especially in the decade between the beginning of Kettle (1966) and the peak of Long Spruce. The following are some of the key changes which occurred:
    - original population, and accompanying community lifestyle, was engulfed in a nine-fold increase in population over the decade
    - community was totally transformed, physically, from a scattered collection of homes to a southern style town with grid street system, houses on lots, etc.
    - politically, Gillam changed from a hamlet to part of an LGD, with an administrator and, eventually, elected council
    - through the Kettle period, in particular, a "boom town" atmosphere prevailed with almost all people associated with construction of community infrastructure or the dam itself
    - although more permanent operations people have become part of community over the years, turnover is still high and the "transient" character of Gillam remains; even many long term residents, i.e., those resident since 1966, plan to leave the community to retire elsewhere (with the exception of the Fox Lake Band)
    - cohesion in the community has been greatly affected by corporate sponsorship of employees; divisions of company, and

even rank within companies, often carry through to social associations and even to relationships among school children; the most obvious division is between the Fox Lake Band/Metis people and the non-native community

- most dramatically affected by the physical, political and social changes in Gillam is the Fox Lake Band; in the decade between the beginning of Kettle and the mid-point of Long Spruce, the Fox Lake Band has changed from a largely self-sufficient group of people dependent on trapping, country food and employment with CN, to a lifestyle based to a large degree on social assistance (about 80 per cent unemployment) and with only a handful of people taking part in the traditional harvest; many of those interviewed noted that social problems (alcohol abuse, family breakdown) are now pervasive

- a number of key persons indicated that alcohol consumption and drug abuse among the community at large increased during construction; however, this view was not universal and the reasons for the increase among those who shared the view were not consistent. The following were cited as contributing factors:

    a. money available to buy alcohol and drugs;

    b. increased availability of drugs via camp sources;

    c. influence of "hard working, hard playing" lifestyle of construction workers (this last point was disputed by a few of those interviewed who indicated that the majority of camp workers are concerned with saving for their family in the south and do not deserve this kind of image).

- The presence of the Limestone project is likely to result in the same kinds of social changes in Gillam noted during earlier construction projects. However, the presence of Sundance for construction workers and families and the location of the construction camp further from Gillam than the other two camps, should at least lessen the magnitude of the changes for Gillam. Furthermore, the community is at least aware of the kinds of lifestyle changes to expect, having been through two previous projects.

- Bird can also expect to experience the same kinds of social changes as occurred during the previous projects, possibly exacerbated by the close proximity to the construction camp.

- Though these changes in lifestyle and community cohesion can be outlined, discussed, and their probability estimated to some extent, there is little in the way of impact management which can alter these changes. The only measure which may help to a limited degree is to ensure that social supports (e.g., professional social services, alcohol and drug counselling) are available if people choose to make use of the services. These resources are currently available in Gillam; some expansion of these services may be required.

## RESERVE LAND AND TREATY LAND ENTITLEMENT

- Former Chief of the Fox Lake Band indicated that, at the present time, he saw no concern. Fox Lake Band is building houses at Bird which is in the reserve area currently set aside. They have also shown interest in an area north and west of this (3 km (2 mi) on either side of the Limestone River and 6 km (4 mi) along the river; the airstrip would be excluded). The new area includes borrow pits designated by Manitoba Hydro.

## HOUSING

### Construction Phase

**Gillam**

- Gillam has ample physical space to accommodate construction and other workers and their families.
- Two hundred trailer lots could be available relatively quickly (within two to three months, depending upon requirements to reactivate connections to main sewer and water lines); an additional 200 trailer lots could be made available on an emergency basis. We would emphasize that probable requirements should be communicated to the LGD as soon as possible to allow them to begin preparation of these sites.
- Where the shortage occurs, however, is in available in-place units. Although some empty trailers are in Gillam (about 42), it is not known if the owners would be willing to rent to newcomers; some units have deteriorated over the years and require significant repair. Virtually no house units are available; the vast majority are corporately owned. This means that workers without corporate sponsorship will probably move trailers to available lots in Gillam.

**Sundance and Limestone Camp**

- No shortage of accommodation is expected; Sundance is designed to accommodate all married construction workers who choose to establish a home there and the camp will accommodate all single status persons.

**Bird**

- No project-related in-migrants and their families are expected to reside at Bird.

Operations Phase

- No issue is anticipated during the operations phase because Manitoba Hydro will provide corporate housing for new operations workers and their families.
- No permanent housing will remain at Sundance.

RECREATION AND LEISURE

- No issue is expected with regard to recreation facilities for construction-related population in Gillam, Sundance or the camp. The three recreation facilities provide ample capacity to accommodate new population.
- Organized recreation activities may be enhanced by the new population available to take part. In particular, a number of people noted that competitive team sports would be improved in the local area by the addition of new teams from Sundance.
- Issues associated with outdoor recreation, e.g., hunting, trapping, snowmobiling, are dealt with in Chapter 4. Water recreation may be a problem; there could be more accidents on the Nelson River due to use of the river by inexperienced boaters. This item will be considered further in Phase III.
- No cottages will be flooded by the operating forebay.
- Demand for cottages at the Limestone forebay is likely to be minimal, because of the steepness of banks, which preclude ready access to water.

# APPENDIX C

## POPULATION ANALYSIS FOR
## GILLAM, BIRD, SUNDANCE AND THE LGD OF GILLAM

This appendix contains an analysis of historical and projected populations for Gillam, Bird, Sundance and the LGD of Gillam. Further detailed analysis is provided for the community of Gillam. Five cases are examined:

(1) June 1976 -

census period; also a time when the Long Spruce project was at a very high level of activity

(2) June 1981 -

census period; at this time there was no construction of hydroelectric generating plants occurring in the Limestone Study Area

(3) Summer 1987 - without Limestone -

projection for the period when the Limestone project is supposed to be at its peak; indicates what the population would be in the study area at that time in the absence of Limestone construction

(4) Summer 1987 - with Limestone -

projection of population in the study area when Limestone construction is at a peak and the project is occurring

(5) 1994 - with Limestone - without Conawapa -

projection of the population in the study area once Limestone construction is completed and the project is fully operational; does not take into account possible effects of Conawapa construction, if it was occurring at that time.

The results of the analysis are summarized in Table C-1. Annex C-1 describes the key characteristics of the cases examined while Annex C-2 describes the methodology and assumptions used for each case.

## TABLE C-1

## POPULATION ANALYSIS OF GILLAM, BIRD, SUNDANCE, LGD OF GILLAM

| | Historical | | | | Projections | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | June 1976 | | June 1981 | | Summer 1987 - without Limestone | | Summer 1987 - with Limestone | | 1994 - with Limestone without Conawapa | |
| | # of residents | % of total | # of residents | % of total | # of residents | % of total | # of residents | % of total | # of residents | % of total |
| **A. COMMUNITIES AND LGD** | | | | | | | | | | |
| 1. Gillam | 2,823 | 71 | 1,406 | 97 | 1,154 | 84 | 1,347 | 32 | 1,342 | 81 |
| 2. Bird | 16 | 1 | 21 | 1 | 187 | 14 | 207 | 5 | 277 | 17 |
| 3. Sundance | 0 | 0 | 0 | 2 | 0 | 2 | 1,225 | 29 | 0 | 2 |
| 4. Construction Camp | 1,116 | 28 | 0 | 0 | 0 | 0 | 1,400 | 34 | 0 | 0 |
| 5. Total - LGD of Gillam | 3,955 | 100 | 1,427 | 100 | 1,341 | 100 | 4,179 | 100 | 1,619 | 100 |
| **B. GILLAM - SELECTED CHARACTERISTICS** | | | | | | | | | | |
| 1. Construction workers and families - direct and indirect | 1,225 | 43 | 0 | 0 | 0 | 0 | 88 | 7 | 0 | 0 |
| 2. Limestone operations workers and families - direct and indirect | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 132 | 11 |
| 3. Other construction related | 227 | 8 | 0 | 0 | 0 | 0 | 140 | 10 | 0 | 0 |
| 4. Fox Lake Band members | 198 | 7 | 226 | 20 | 108 | 10 | 108 | 8 | 108 | 9 |
| 5. Residual | 1,173 | 42 | 1,145 | 80 | 1,011 | 90 | 1,011 | 75 | 1,011 | 80 |
| 5. Total - Gillam | 2,823 | 100 | 1,371 | 100 | 1,119 | 100 | 1,347 | 100 | 1,251 | 100 |

## ANNEX C-1

## CHARACTERISTICS OF YEARS AND CASES EXAMINED

### JUNE 1976

- 1976 Census undertaken in this month
- Long Spruce construction in its fourth year -- one of three very high activity years
- 1,401 construction workers on Long Spruce; 1,116 living in camp, 295 living in Gillam (up to 50 being local residents)
- workers living in Gillam nearing its peak for Long Spruce construction
- Stage 1 Limestone construction getting under way, work being done on infrastructure, Sundance townsite not yet occupied (people start to move in in September 1976)

### JUNE 1981

- 1981 Census undertaken this month
- no construction of hydro generation projects occurring on the Lower Nelson -- Long Spruce completed and in operation, Limestone temporarily stopped
- Fox Lake Band members still living mostly in Gillam, but contemplating a major move to Bird
- Gillam population has adjusted to loss of major hydro construction activity in the area
- Sundance is uninhabited
- baseline reference case for "with Limestone" projections
- no construction of hydro generation projects occurring on the Lower Nelson

### 1987 - WITHOUT LIMESTONE

- major housing development at Bird completed. Fox Lake Band added about 45 new housing units since 1981. Many band members have relocated from Gillam to Bird to occupy the housing. Bird residents still rely heavily on Gillam for services and supplies

- CNR and LGD make significant employment cutbacks in 1982 to 1984 leading to a loss of available jobs and associated population since 1981

1987 - WITH LIMESTONE

- Limestone construction reaching its peak level (assuming 1990 in-service date)
- 1,800 construction workers; 250 to 300 residing in Sundance, about 100 to 150 in Gillam and Bird (over half being local residents), the remaining 1,400 in the Limestone construction camp
- Fox Lake Band members in Gillam have relocated to Bird to occupy some 45 new housing units; residents rely on Sundance, the construction camp and Gillam for services
- CNR and LGD job and population cutbacks occurred since 1981

1994 - WITH LIMESTONE (WITHOUT CONAWAPA)

- construction of Limestone completed; Limestone fully operational
- 30 Limestone operations workers and their families living in Gillam
- Fox Lake Band has several businesses operating at Bird as well as an elementary school; Bird residents are less reliant on Gillam for services in the 1987 without Limestone case
- Sundance is uninhabited

## ANNEX C-2

## EXPLANATIONS AND ASSUMPTIONS - JUNE 1976

LGD of Gillam = 2,839 (1976 Census figure) + 1,116 (workers living in Long Spruce construction camp) Census excludes workers living in construction camps

Construction Camp - workers living in Long Spruce construction camp; not included are workers living in Limestone camp

Sundance - in July 1976, Sundance was not occupied; it began to be occupied by families in September 1976

Bird - estimate for June 1977 by Taunton for Polar Gas based on MHSC data

Gillam = 2,823 (1976 Census figure) - 16 (population of Bird)

Construction Workers etc. = 250 new Long Spruce workers in Gillam x 1.4 new indirect employment filled by in-migrants x 3.5 average family size; it is assumed that 45 of the 295 Long Spruce workers in Gillam resided there prior to the start of Long Spruce construction

Limestone Operations Workers, etc. - Limestone operations not started

Other Construction Related = 1976 population of Gillam - 1981 population of Gillam - construction workers, etc. implies 65 indirect jobs in Gillam related to expenditures by workers in camps and contracts with Hydro

Fox Lake Band Members - estimate for June 1977 by Taunton for Polar Gas based on MHSC data - represents 65% of the band

Residual = 2,823 (Gillam) - (1,225(construction workers etc.) + 227 (other construction related) + 198 (Fox Lake Band members))

## EXPLANATIONS AND ASSUMPTIONS - JUNE 1981

LGD of Gillam - 1981 Census

Construction Camp - Long Spruce construction completed

Sundance - no construction activity in Limestone area; no population residing at Sundance

Bird - DIAND estimate, 1981

Gillam = 1,427 (LGD of Gillam population) - (21 (Bird population)

Construction Workers, etc. - no hydro generation project construction in Gillam area

Limestone Operations Workers, etc. - Limestone operation not started

Other Construction Related - no hydro generation project construction occurring in Gillam area

Fox Lake Band Members - 65% of estimated band size in 1981; band size from DIAND estimate

Residual = 1,371 (Gillam) - 226 (Fox Lake Band members)

## EXPLANATIONS AND ASSUMPTIONS

## SUMMER 1987 - WITHOUT LIMESTONE

Bird - main relocation of Fox Lake Band members from Gillam to Bird completed by 1986; assume 45 new housing units in place at Bird, including 3 for seniors
= 28 (1981 population + 1 per year) + 149 (45 new families x 3.5 average family size) + 10 person growth for 1 year (natural growth and 2 new housing units)

Fox Lake Band Members in Gillam = total band members in Gillam and Bird estimated to be 295 (1981 population + 8 new members per year) 1976-1981 average annual increase was 6.6 members
= 295 (Gillam + Bird) - 187 (Bird)

Gillam = 1981 population - (200 due to loss of CNR and LGD jobs and associated population since 1981 + 108 due to loss in Fox Lake Band members since 1981)

Sundance - same as 1981

Construction Camp - same as 1981

LGD of Gillam = 1,154 (Gillam) + 187 (Bird)

Construction Workers, etc. - same as 1981

Limestone Operations Workers, etc. - same as 1981

Other Construction Related - same as 1981

Residual = 1,119 (Gillam) - 108 (Band members in Gillam)

## EXPLANATIONS AND ASSUMPTIONS

## SUMMER 1987 - WITH LIMESTONE

Bird = Summer 1987 - without Limestone estimate + 25 people who move in due to Limestone construction (possibly other band members)

Fox Lake Band Members in Gillam - same as summer 1987 - without Limestone estimate

Sundance = 350 families x 3.5 members/family

Construction Camp = 1,800 construction workers - (300 living in Sundance + 100 living in Gillam and Bird)

Construction Workers, etc. = 25 construction workers x 3.5 family members; a few construction workers will choose to live in Gillam to be closer to high schools, a wider range of services

Limestone Operations Workers, etc. - Limestone not yet operating

Other Construction Related = 40 new workers x 3.5 average family size; 40 new workers is downscaled version of Long Spruce experience

Gillam = summer 1987 - without Limestone estimate + Construction Workers, etc. + Other Construction Related

Residual = 1,347 (Gillam) - 88 (Construction Workers, etc.) - 140 (Other Construction Related) - 118 (Fox Lake Band members)

LGD of Gillam = 1,347 (Gillam) + 202 (Bird) + 1,225 (Sundance) + 1,400 (Construction Camp)

## EXPLANATIONS AND ASSUMPTIONS

### 1994 - WITH LIMESTONE (WITHOUT CONAWAPA)

Bird - Summer 1987 - without Limestone estimate + 10 persons growth per year (natural growth and 2 new housing units per year)

Sundance - same as 1981 since no major hydro construction activity is assumed in Gillam area

Construction Camp - no major hydro construction activity in Gillam area

Fox Lake Band Members in Gillam - same as 1987 - without Limestone; assumes balancing of losses to Bird and additions due to natural growth

Construction Workers, etc. - no major hydro construction activity in Gillam area

Other Construction Related - no major hydro construction activity in Gillam area

Limestone Operations Workers, etc. = 25 families x 1.5 indirect families x 3.5 members/family; assumes 5 operations workers are from Gillam area

Gillam = 1,011 (residual population for 1987) + 108 (Fox Lake Band members) + 188 (Limestone operations workers)

LGD Gillam = 1,342 (Gillam) + 277 (Bird)

# APPENDIX D

## HOUSEHOLD SURVEY - LETTER OF INTRODUCTION AND QUESTIONNAIRE

# LIMESTONE MONITORING: SURVEY QUESTIONNAIRE

## LETTER OF INTRODUCTION

Dear Gillam/Bird/Sundance Resident:

### HOUSEHOLD SURVEY TO STUDY EFFECTS OF LIMESTONE PROJECT

You are probably aware that construction of the Limestone project is now under way. This activity is likely to produce some economic, social and environmental changes in Gillam, Bird and Sundance.

As part of the government's review and approval process, Manitoba Hydro undertook a study to identify ways of making sure that these changes were not too disruptive. One of the recommendations of this study was to conduct an annual survey of every household in Gillam, Bird and Sundance to find out what changes were taking place as a result of the project and also to collect local residents' suggestions for dealing with the effects of the project. The first of these surveys will be carried out next month, before there is too much construction activity, to have a reference point for assessing changes in future years. Follow-up surveys are planned for each of the next five years.

### FIRST SURVEY: OCTOBER 1985

InterGroup Consultants Ltd. of Winnipeg is conducting this year's survey. We have received support and approval from the councils of the LGD of Gillam and the Fox Lake Band to proceed. Three local residents have been hired to help us. One of these people will be contacting you by telephone or in person in October to ask some questions about the people in your household, e.g., their age and name, and about any effects you might have noticed on your daily life from the Limestone project up to now. *For this survey to be most useful we need information from every household. Therefore, we would appreciate your co-operation.*

### HOW INFORMATION WILL BE USED

The information that you supply will be sent to InterGroup's offices in Winnipeg where it will be summarized. These results will be used to prepare a report which will be provided to your elected councils and others who are interested in the effects of the Limestone project.

*We wish to emphasize that any information you provide will be kept confidential.*

Information about individual households will not be presented in our report and individual surveys will be stored in a vault at InterGroup's offices in Winnipeg.

If you have any questions or concerns, feel free to call one of the members of your elected council or to call me collect in Winnipeg at (204) 942-0657.

Thank you for your co-operation.

Yours truly,

INTERGROUP CONSULTANTS LTD.

Barb MacKay

Barb MacKay, Researcher

## LIMESTONE MONITORING: SURVEY QUESTIONNAIRE

Name of Interviewer ____________

| | | | | | |
|---|---|---|---|---|---|
| QUESTIONNAIRE NUMBER ______<br>Name of person to contact: ______<br>______ | Community:<br>Gillam ______<br>Bird ______<br>Sundance ______<br>Other (specify)<br>______ | Address:<br>______<br>______<br>______<br>______<br>Telephone number:<br>______ | Type of Building:<br>single wide trailer ____<br>double wide trailer ____<br>single detached house ____<br>duplex ____<br>CN employee residence ____<br>Hydro empl. residence ____<br>Other (specify) ______ | Number of Dwelling Units in Building:<br>1 ___<br>2 ___<br>over 2 (specify) ______ | Number of Occupied Dwelling Units in Building:<br>1 ___<br>2 ___<br>over 2 (specify) ____ |

| PART A - HOUSEHOLD INFORMATION<br>names of all persons residing in this residence | age | sex (m) (f) | grade, if in school | years (months) resided in community during current stay | previous place of residence (community, province) | member of Fox Lake Band (y) (n) |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |
| 11. | | | | | | |

| PART B - EMPLOYMENT INFORMATION<br>title or nature of job (incl. housewife, student, unemployed) | name of present employer | years worked for present employer | full-time (f-t) or part-time (p-t) employment | location of employment (community or site) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Put an * before the name of person supplying information for the questionnaire

### PART C - RECENT RESIDENTS

Has anyone in your residence moved into the Gillam/Bird/Sundance area since January 1985? If yes, complete below:

| Date when resident(s) moved into area (specify month and year) | Name of resident(s) who moved in on that date | Reason(s) for moving into the area (be specific) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Answers to these questions may be provided by more than one adult in the dwelling unit

| | NAME ______ | NAME ______ | NAME ______ |
|---|---|---|---|
| PART D What notable effects has the presence of Limestone construction had on your life during the last year (be as specific as possible)? | | | |
| economic effects (e.g., provided a job -- was formerly unemployed) | | | |
| social effects (e.g., workers come to town and are rowdy) | | | |
| affects on quality of service provided (e.g., longer line-up at grocery store?) | | | |
| other effects (e.g., more people using my favourite fishing spot) | | | |

| | | | |
|---|---|---|---|
| PART E Are there any effects of the Limestone project that you would like to see something done about? | | | |
| Do you have any suggestions on what should be done? | | | |